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Christina Nikolova[1]
Veronika Garkova[2]

EVALUATING THE IMPACTS OF PASSENGERS' RIGHTS POLICY ON THE COMPETITIVENESS OF AIRLINES AND AIRPORT OPERATORS USING THE DYNAMIC PROGRAMMING APPROACH[3]

The passengers' rights protection policy is crucial for providing the quality of air transport services and has a significant impact on the competitiveness of airlines and airport operators. This impact can be measured by defining a system of quantitative and qualitative indicators and can be managed by adopting adequate efficiency-enhancing measures of this policy that contribute to the greater competitiveness of all the players in the European air transport market. The study aims to present the opportunities of a dynamic programming approach to enhance the efficiency of passenger rights' protection policy in terms of the competitiveness of airlines and airport operators. The application of the model has been empirically tested and, on this basis, a proposal to update the passengers' rights protection policy has been worked out by the authors and the expected impacts and effects of its implementation have been examined.
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1. Introduction

The globalization imposed increasing mobility of people and goods, as well as a growth of air transport activity worldwide in recent years, and it led to an increase in the demand and supply of passenger transport and the need to create more efficient processes for servicing the air passengers and their luggage (Nanfosso, Hadjitchoneva, 2021). These processes are an important part of the concept for improving the quality of air transport services. A strong competitive environment in air transport leads to an expansion of market opportunities for carriers. Airlines aim to diversify their operations to reduce costs and increase the quality of their services. In addition, the emergence of low-cost carriers on the European market leads

[1] *Christina Nikolova, professor, doctor, University of National and World Economy, phone: 028195611, e-mail: hrnikolova@unwe.bg.*
[2] *Veronika Garkova, doctor, University of National and World Economy, phone: 028195611, e-mail: veronikagarkova@gmail.com.*
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to further stimulating competition in the air sector and contributes to an increase in the efficiency of airports in operating flights (Curry, Gao, 2012). This, on the other hand, requires the development of new measures of the European air passengers' rights protection policy. Its aim is to achieve effective and harmonized implementation with appropriate instruments (mechanisms) to create a uniform and clear interpretation of the EU laws. This will ensure equal conditions for all air transport operators and will support building European standards for the protection of citizens (European Commission, 2011).

At this stage in studying the influence of air passengers' rights protection policy, there are gaps and uncertainties that hamper its effectiveness and impede the assessment of its impacts on the competitiveness of airlines and airport operators. Airlines are taking advantage of the current situation to justify their delays as 'extraordinary circumstances' and thus not to pay compensation to passengers. It is, therefore, necessary to identify appropriate measures to increase the effectiveness of the policy. These measures must be aimed at clarifying the concept of 'extraordinary circumstance' – strictly determining which cases are identified as such and which are not; setting up a compensation fund for long delays; providing rules for the establishment of representatives (including authorized) of airlines at each airport, for decision-making in case of delays; reviewing the compensations' sizes; sharing the burden of compensations with third parties, etc.

Obviously, the air passengers' rights protection policy needs a revision and there is a need to improve its efficiency in order to achieve better air services' quality and airline performance, especially in the current situation. Something more, a research gap exists with regards to the assessment of the impacts of passengers' rights protection policy on airlines and airport operators' competitiveness, that could be filled by suggesting an appropriate approach for assessing these impacts.

The main goal of this study, with regards to the assessment of the impacts of passengers' rights protection policy on the European level, is to apply an economic analysis method for the examination of quality indicators and measures applied and their influence on the competitiveness of airlines and airport operators. An important condition for increasing competitiveness is the implementation of an adequate and successful pricing policy, which is built based on an in-depth study of the aviation sector (Wehner, et al., 2018). For airlines to successfully compete with other air carriers offering lower prices, it is necessary to monitor trends of change in the demand-supply ratio of air transport (Costa, et al., 2019). The analysis will reveal opportunities to increase the quality of services, as well, which is a prerequisite for attracting more passengers and increasing the competitiveness of airlines and airport operators (Mutafchiev, 1997).

2. Quality of Services and Competitiveness in Air Transport as a Concept

The competitiveness as a term refers to the ability to surpass competitors under conditions of free competition (Bao, Xie, 2002). Bao and Xie define the competitiveness of airlines and airport services as "the ability to provide high air passenger services' quality at reasonable prices by ensuring passengers' right protection when compared with other competing airlines and airports under certain traffic conditions". With regards to this, the authors of the current

study argue that passengers' rights protection policy has a potential to provide improvements in the quality of passenger transport by air and, accordingly, to enhance the competitiveness of air carriers and airport operators. Therefore, in order to assess the impacts of passengers' rights policy on the competitiveness of airlines and airport operators, it is necessary to define a system of air transport services' quality indicators and determinants which reflect both airlines and airports' services. The relationship between the passengers' rights policy and the competitiveness of airlines and airport operators, as examined in this article, is modelled according to the European model for impact assessment of passengers' rights policy, adapted in line with the objectives set out in the study.

The competitiveness of an airline is determined by two main groups of indicators: pricing policy and levels, and the quality of services offered. The main economic prerequisites for increasing the competitiveness of air carriers are the reduction of the costs of carrying out the transport activities and the improvement of the quality of transport services. By reducing costs, airlines could offer competitive transport prices. Improving quality- in turn – provides an opportunity to attract more passengers, leading to an increase in flight intensity, and thus making for higher revenues for airlines (Bakalova, Nikolova, 2010, p. 175).

The achievement of high quality of the services offered is characterized by a system of indicators, which are an integral part of the air transport process. These indicators include Security, Safety, Regularity, Accuracy, Flights' intensity, Flights' duration, Convenience and Culture of service (see Table 1).

Table 1

Indicators and determinants of air transport quality

Indicators	Measures
Security	development and modernization of aircraft and aerodrome facilities to ensure unhindered travel
Safety	necessity of continuous improvement of the operation of aircraft; improving the qualification of staff; organizational factors of the movement to ensure safe flights
Regularity	frequency of the proposed flights, overcoming adverse weather conditions
Accuracy	take-off and landing of aircraft in accordance with the announced timetable; depends on the workload of air traffic; ensuring the roadworthiness of aeroplanes
Flights' intensity	number of flights offered (how many times a week flights to a destination are made)
Flights' duration	reducing travel time; possibility of catching up on flight delay
Comfort	comfort and additional services provided on board – depending on the type of aircraft; location of seats and travel class
Culture of service	meeting the needs of different types of services during the journey and courtesy of cabin staff; pre-flight control and handling of passengers and their baggage

Source: Suggested by the authors based on SERVQUAL scale (Jain & Gupta, 2004) and adapted according to Mutafchiev (1995)

All of the indicators should be incorporated into the assessment model in order to reveal to what extent they correspond and influence the passengers' rights protection policy. Based on this, and on the other hand, recognizing the quality of services as a strategic tool for attaining operational efficiency and improved business performance, i.e. business competitiveness, the

authors use the SERVQUAL approach suggested by Jain and Gupta (2004) in their article 'Measuring Service Quality: Servqual vs Servperf Scales'. According to them, it is not easy to identify and measure the service quality due to inherent characteristics of services that make them different from goods. SERVQUAL and SERVPERF are presented as major service quality measurement scales. With regards to the explanatory power of the models, Jain and Gupta provided evidence that the SERVPERF scale provides a more convergent and discriminant-valid explanation of service quality construct. However, the scale is found deficient in its diagnostic power. They provided evidence that it is the SERVQUAL scale that outperforms the SERVPERF scale by ensuring higher diagnostic power to define areas for managerial and policy interventions in the event of service quality shortfalls (Jain & Gupta, 2004).

These findings are further supported by the study of Carvalho and Medeiros (2021), making a comparative analysis of two evaluation models (SERVQUAL and SERVPERF) to investigate the factors that influence the quality of airline services, using statistical techniques such as Cluster Analysis and Structural Equation Modeling (SEM). They found out that the SERVQUAL and cluster analysis allow airline managers to identify and prioritize gaps in service delivery according to criticality, aiming at the allocation of efficient resources by the airline. The SERVPERF and SEM provide statistical evidence of the impact of different dimensions of service quality on customer satisfaction, highlighting the direct relationship between satisfaction and different quality indicators. Considering how customers evaluate the service provided by airlines, particularly regarding the service they receive from airport employees, this study has relevance for decisions taken by airline managers to develop quality services and provide guidelines for improvements in airline services (Carvalho, Medeiros, 2021).

Bellizzi et al. (2018), in their study "Air Transport Passengers' Satisfaction: An Ordered Logit Model", argue that the airline industry has a vital role in countries' development and competitiveness. They pay attention to the fact that airport facilities and services are the first experiences that passengers receive upon arrival at the airports. The authors propose a tool for measuring airport service quality starting from the passengers' reviews about services by using the Ordered Logit Model for evaluating the influence of different service factors on service quality, by considering passengers' satisfaction with the service factors and the overall service (Bellizzi et al., 2018).

Another important issue to be considered when assessing the quality of air passenger services is to reveal whether there exists a distinction between the service quality of full-service and low-cost operators. Lim & Lee (2020), in their study called "Comparisons of service quality perceptions between full-service carriers and low-cost carriers in airline travel", quantitatively determine the dimensions of service quality parameters that are deemed as most essential by travellers. The authors apply Latent Dirichlet Allocation Topic Modeling to a vast number of online reviews for airline services to compare service quality between full-service carriers (FSCs) and low-cost carriers (LCCs). The results of their study show that the most significant dimensions for FSCs and LCCs are tangibles and reliability. The least significant dimensions revealed by the study are assurance and empathy, respectively. By comparing extracted dimensions in detail, Lim & Lee discover specific differences in traveller perceptions between FSCs and LCCs (Lim, Lee, 2020). However, in terms of air

passengers' rights protection policy on the European level, there are not any specific provisions for low-cost operators compared to full-service carriers that make a difference in the treatment of the quality of services in question.

Additionally, Curry and Gao (2012) have proved that though both the service quality and customer satisfaction have a positive influence on repurchase intentions, customer satisfaction is a much stronger driver in influencing repurchase loyalty than service quality, which implies that these constructs interact in a different manner in a low-cost setting. This finding is of crucial importance with regards to airlines and airports' competitiveness and it provides a clear relation between the level of quality of air passengers' services and pricing models and levels applied by the airlines and airports.

With regards to the eventual differences in the level of competitiveness of FSCs and LCCs, Alamdari and Fagan (2005) found out that although an increasing number of 'hybrid' low-cost models are achieving low operating costs compared to FSCs, offering low fares, and returning attractive operating profit margins, there is a case for recommending adherence to the original model to ensure greater profitability. They suggest a study providing evidence that the low-cost carriers tended to follow a differentiation strategy as opposed to cost leadership on which the original low-cost model was based (Alamdari, Fagan, 2005). However, this does not change the initial point and the equal basis for treating the same way LCCs and FSCs when applying the air passengers' rights protection policy.

Another piece of research dedicated to the interrelation between air services' quality and prices investigates how perceived price, airline service quality, perceived value, passenger satisfaction and airline image determine passengers' future behavioural intentions (Park, Robertson, Wu, 2006). The authors found that there were significant relationships between air services quality and prices. Perceived price, perceived value, passenger satisfaction, and airline image were each found to have a direct effect on passengers' future behavioural intentions. Thus, Park, Robertson, and Wu (2006) provide a solid ground for further research through extended modelling of impacts of the air passengers' protection policy on the service quality and pricing policy being the main aspects of the competitiveness of airlines and airports.

Similarly, Martin, Roman and Espino (2008), in their article called "Willingness to Pay for Airline Service Quality", provide empirical monetary valuations of air travel regarding level-of-service attributes. They examine the variations in values, according to different characteristics of the services, such as price, penalties for changes in the ticket, legroom, food, etc.; the currently experienced level of the service quality, and various socio-economic factors that affect the characteristics of the air trip and passengers. Thus, they provide a prerequisite for evaluating the willingness-to-pay for different improvements of service quality (Martin, Roman, Espino, 2008). All these studies suggest important arguments for incorporating passengers' rights policy into the wide service quality framework and evaluating its efficiency potential to contribute to higher airlines and airports' competitiveness.

An important study, providing ground for identifying the role of relational benefits between service quality, the level of satisfaction and loyalty of passengers is authored by Chen and Hu (2013). The authors have performed a personal survey of air passengers and found that

service quality has positive impacts on relational benefit and customer loyalty in the airline industry. They argue that service quality, basically, seeks to measure the company's performance along transactional dimensions, whereas relational benefits measure the intangible aspects of relationships between the airlines and their clients, related to the core elements of the service (Chen, Hu, 2013).

Dálfonso and Nastasi (2014), in their study called "Airport-Airline interaction: some food for thought", provide additional arguments for pointing out our scientific research interest not only to the air carriers' service quality but to airports' operators, as well. They provide an interpretive analysis of vertical relations between airports and carriers, while assessing the way in which deregulation of the airline market and the privatization of airports have created incentives for the airport–airline interactions in providing air passenger transport services (Dálfonso, Nastasi, 2014).

Finally, in order to broaden the focus of the study and to take into account the impact of the COVID-19 pandemic on the air transport sector and passengers' rights protection, account should be taken of the specificities of the change in demand for air transport over the last 2 years. Gallego and Font (2021), in their study "Changes in air passenger demand as a result of the COVID-19 crisis: using Big Data to inform tourism policy", provided evidence that for travel during the May to September 2020 period, the desire to travel (based on the number of flight searches) has dropped by about 30% in Europe and the Americas, and by about 50% in Asia, while the intention to travel (the number of flight picks, the final selections amongst flight searches) has dropped a further 10-20%. Most source markets remain optimistic about air travel during the whole 2021, suggesting a U shape recovery. However, the recent developments in air transport show a rather flatline L shape of recovery (Gallego & Font, 2021). Something more, the UK consultancy SKYTRAX, running an airline and airport review and ranking site, provide up to date COVID-19 Airlines and Airports' Safety Rating as a trusted assessment and certification of airline and airport's hygiene and safety measures during the coronavirus pandemic, based on detailed and professional investigation of the standards being provided by the airlines at the airports and onboard flights. It is the world's first COVID-19 Safety Accreditation for the airline industry, regarded as a global benchmark for defining safe travel assurance for customers by complex analysis of the hygiene improvement procedures and systems introduced by airlines during the coronavirus pandemic. SKYTRAX do rate an airline's front-line staff adherence to safety standards, based on direct audit experience and analysis of how efficiently and consistently airport and cabin safety standards are applied by an airline's staff, before and during flights, thus providing the air passengers' rights during their travel. The Ratings are based on the effectiveness and consistency of each airline's and airport's COVID-19 cleanliness, health, hygiene, and safety protocols, and do not evaluate any temporary service changes due to COVID-19 (e.g., closed lounges, cuts in onboard catering etc.) (Skytrax, 2021). The site doesn't publish comparative ratings of airlines and airports' safety records because there is no single accurate, global reference of safety standards and/or safety incidents that provides information that can be truly trusted by passengers, or which supplies total accuracy to customers in choosing an airline.

On the other hand, recent studies related to the developments in passengers' rights protection policy during the COVID-19 pandemic show that air passengers were not informed fully

about their rights during the COVID-19 pandemic (European Court of Auditors, 2021). The study provides information and statistics showing that in the initial period of the crisis, many passengers were not reimbursed, or had no other choice than to accept vouchers. The authors recommend that the Commission should better protect the rights of air passengers and inform them about their rights; enhance the coordination of national measures and better link State aid to airlines to the reimbursement of passengers; and improve the tools and legislation for safeguarding air passenger rights.

3. Approaches to Examining the Interrelations Between Passengers' Rights Protection Procedures and the Competitiveness of Airlines and Airport Operators

In order to examine the interrelations between procedures for the protection of passengers' rights and the competitiveness of airlines and airports, as well as to assess the impact of the policy adopted in this field at the European level, the dynamic programming method may be applied (Bellman, Dreyfus, 2015). The need to evaluate the interrelations between the passengers' rights protection procedures and the competitiveness of airlines and airports impose some specific computational requirements that render infeasible the exact solution of the problems related to this policy. The authors of this study suggest their view on the application of an efficient economic method based on dynamic programming for approximating solutions to enhance the efficiency of air passengers' rights policy and provide positive results on airlines and airport operators' competitiveness. The approach "fits" a linear combination of pre-selected basic functions to the dynamic programming approach (Farias, Van Roy, 2003). With regards to this, it is suitable for developing multi-stage decisions on tasks related to air transport management, as suggested by Mutafchiev and Vasilev (1999). The tasks related to the definition of measures to protect passengers' rights, as a part of the policy to increase the competitiveness of carriers and airport operators, are also multi-stage. The consistent development of different variants for upgrading measures and procedures to protect passengers' rights, considering air transport quality and competitiveness parameters, is a variety of dynamic programming. In the step-by-step resolution of this task, results can be obtained on the expected effects and impacts of the implementation of the relevant measures to protect passengers' rights and their impact on the quality of air services and the competitiveness of airlines and airports (Mutafchiev, 2003). The ultimate objective of this approach is to prioritize those measures that have the most significant positive impact and to suggest them for inclusion in the Strategy for the protection of air passengers' rights.

Dynamic programming (optimization) is based on the principle of optimality formulated by Richard Bellman in 1962 as follows: "a policy is optimal if, for a given stage, regardless of what the decisions of the previous stages were, the decisions to be taken draw up an optimal policy, considering the results of the previous stages" (Bellman, 2007). Applying this principle to solving the specific task can be defined as follows: "optimal policy (strategy) contains only optimal sub-policies". Very often, when solving economic tasks of strategic importance, it is necessary not to make an independent decision at a particular time, but a number of interconnected and consistently implemented decisions on the management of a

system, such as air quality indicators following the logic of the application of dynamic programming as suggested by Cvitanić, J., Possamaï, D. & Touzi, N. (2018).

The principles of dynamic programming can also be applied in solving tasks that are not multi-stage but depend on the logic of the decision process itself (Belmann & Dreyfus, 2015). If available measures are given (number) V, which must be distributed in the most economically advantageous way between the i processes (i = 1,2…n) for quality improvement, it can be assumed that the use of part of these measures b for each process is characterized by an expected effect $w_i=f_i$ (b_i), which means that the *resulting effect is a function of the measures taken*. In cases where the function is of an unclear kind, as it is in the case of the appropriate measure of air passengers' rights protection policy, it is necessary to apply the principles of dynamic programming.

The aim is to explore, through dynamic programming, options to optimize the policy to protect passengers' rights by breaking them into separate elements. The elements of the dynamic programming model will be introduced using an example that solves the following task of minimizing the cost of compensations provided by the airlines. Solving this task will lead to appropriate solutions for providing greater efficiency of air transport services and increased competitiveness of airlines and airport operators.

Assuming that some of the measures under the heading function are

$$w_{i_k} = \sum_{i=1}^{k} b_i \quad (1)$$

then $F\kappa(Zk)$ is the function that characterizes the maximum effect of that distribution in different meanings of the Zk. When including in the solution the task of another process (k+1), the function that characterizes the maximum effect of its distribution in different Zk+1 acquires the following type:

$$F_k + (z_{k+1}) = max[f_{k+1}(b_{k+1}) + F_k(Z_k)], \text{ where } Z_k + b_{k+1} = Z_{k+1} \leq V\ . \quad (2)$$

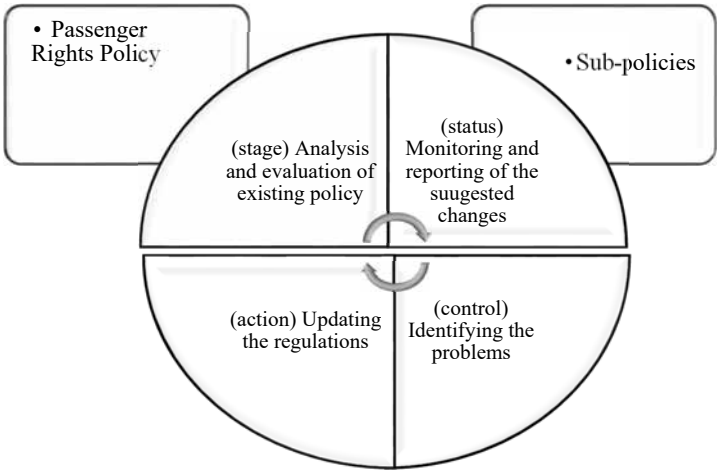
This function defines part of the measures for each $Z_{(k+1)}$ (for variants k+1), result for all k+1 variants as suggested by Mutafchiev & Vasilev (1999). The implementation of the principle of dynamic programming in the resolution of tasks is aimed at determining the optimal sequence of the introduction of new measures to protect passenger rights. The maximum efficiency (F) of transport services in terms of measures to protect the rights of air passengers can be expressed as follows:

$$F = \max\left[V\left(\frac{c.x}{10}\right)\right] \quad (3)$$

Through dynamic programming methods, passengers' rights protection policy is decomposed into separate processes in four steps, which are repeated if policy changes are required when not sufficiently effective. The steps are elaborated based on William Deming's method of cyclicity of processes (2018), which are decomposed into four main steps: PDCA (Plan-Do-Check-Act). The first step sets out the problems and analyses the current regulations. The next step is to monitor and document the proposed amendments. The third step considers the identification of problems, and the latter is an update of the current regulations (Figure 1).

Figure 1

Decomposition of the separate stages in defining the passenger rights policy considering the quality of air transport



Source: Adapted from the Deming cycle for continuous quality improvement.

The dynamic programming approach includes the following elements: stage, condition, variants, target function and recurrent ratio (functional equation). The stage is a part of the task, which has its own alternatives, among which the best is to be found. With regards to the achievement of the objectives of the study, the current regulations related to air passengers' rights protection have been analyzed and their condition assessed. The proposed variants by the EU to change the current regulations have been analyzed based on the maximum values of the coefficients as a target function of the $f_j(x_j)$. The measures with the highest values are included in a new version. For the decision based on the dynamic programming method, all options considered shall look for the one with optimal value, simultaneously providing maximum coefficients and minimum costs.

As a result of the review of the policy on the protection of passengers' rights in air transport and the regulations in force in the EU, certain shortcomings and omissions may be identified therein. All identified problem areas are involved in the development and proposing of new measures to protect passenger rights in the following sections of the article and their impact on the quality and competitiveness of air carriers and airport operators are examined using the dynamic programming approach to solve multi-stage tasks.

4. Defining a System of Measures to Protect Passenger Rights and to Improve the Quality of Air Transport

The European Commission has analyzed the passengers' rights policy applied so far and suggested 4 options (variants) for changing the policy with a view to improving the exercise

and enforcement of air passengers' rights (European Commission, 2017). With regards to this analysis, as well as on the basis of a defined and analyzed system of indicators and determinants of air services quality, the impact of the passengers' rights protection policy on the competitiveness of airlines and airport operators can be assessed.

In order to increase the effectiveness of enforcement policy between December 2011 and March 2012, public consultations have been held and stakeholders have expressed their views on the outcome of these consultations (Steer Davies Gleave, 2012). The Commission has assessed four policy options with a view to improving the exercise and enforcement of air passengers' rights (European Commission, 2014). These are as follows:

Variant 1 focuses on the economic incentives to reduce costs by replacing some of the care obligations (food, hotel accommodation) by airlines.

Variant 2 focuses on balancing policy for stricter implementation with economic instruments. It envisages measures for better coordination of national enforcement authorities in providing information to the Commission on their activities. The Commission, for its part, will have the right to request investigations in circumstances that infringe passengers' rights, especially in cases where airlines from the several Member States are involved. The costs of airlines' obligations to provide care and assistance to passengers will be offset by a reduction in the frequency of the payment of compensations under two sub-options:

- *Variant 2a* provides for an increase in the compensation time threshold from 3 hours to 5 hours after the passenger is entitled to compensation for the inconvenience caused by the flight delay.
- *Variant 2b* provides for the extension of the scope of 'exceptional circumstances' to include technical failures of the aircraft identified and immediately prior to flight.

Variant 3 focuses on stricter enforcement of existing passenger rights without making changes to regulations.

Variant 4 focuses on a fully centralized implementation policy to counter negative incentives arising from compliance costs by setting up a central EU law enforcement body.

The review of the proposed variants and the current regulations gives an opportunity strengths and weaknesses of the policy to be identified and a solution to the problems identified to be proposed by applying the dynamic programming method. The problem areas are identified based on the weaknesses identified in the current study and an alternative option is proposed aimed at improving passengers' rights protection policy and helping to increase the competitiveness of airlines and airports.

In the following sections, by using the dynamic programming approach, the authors propose a new option (variant) to improve the policy on the protection of air passengers' rights, based on the 4 options proposed by the Commission and aimed at helping to improve the quality of the services offered. The results of the implementation of this approach demonstrate the capabilities of the passengers' rights protection policy instruments to provide an increase in the competitiveness of airlines and airport operators.

Table 2

SWOT analysis of the of the air transport regarding passengers' rights policy

Strengths	**Weaknesses**
• fully harmonized application of the Regulations in EU countries; • increase in long-distance passenger service (business and/or personal travel) dur to globalization. The global trend shows an increase in the number of aircraft, an increase in the capacity, as well as an increase in the number of destinations to which different airlines travel; • over the past 20 years, the substantial increase in demand for air transport, both in the EU and globally, has led to a significant development of the European aviation sector. Air transport users benefit from an unprecedented choice of travel options at competitive prices. The number and frequency of domestic flights in the EU and on international routes, as well as the number of passengers, have increased significantly. Low-cost EU carriers are now among the leading carriers, both in terms of passenger carried and market capitalization; • the creation of the single aviation market removes existing restrictions on air transport rights for airlines registered within the EU. Air carriers can operate flights to any destination in Europe without restrictions.	• financial collateral – need to set up a guarantee fund to provide and guarantee compensation payments by airlines; • incomplete formulations – there is a need for precisely defined situations that fall into the category of 'exceptional circumstances' in such a way as not to infringe passengers' rights but at the same time to be relevant to airlines; • formal role of national law enforcement authorities – at this stage, national enforcement authorities, as supervising the implementation of the regulations, act as 'mailboxes' for forwarding complaints to the European Consumer Centre. National enforcement authorities in the EU countries can also be used as arbitrators in cases to identify or reject situations and events categorized as 'exceptional circumstances'; • absence of a single registration system – registration systems are distinguished by individual airlines and airports, and the establishment of a single passenger registration system to be used by all airlines will help to exchange passenger data more quickly and easily between EU airports, both to protect their rights and to increase the security of air transport; • adjustments to the right of re-routing – it is necessary to provide for passengers to be entitled to re-routing, even for delays of less than 4 hours; • lack or failure to provide data from airports – regulated assistance from airports is required by providing video recordings in cases where the passenger has arrived later than the specified boarding time and has therefore been denied boarding; • slow and complicated procedures – need to change the procedure for submitting and handling complaints – to facilitate the use of passengers; • It is necessary to refine the liability of carriers – reduce carriers' liability for minor damage to checked baggage (scratches etc.).
Opportunities	**Threats**
• improving the quality of air transport – by updating the legal framework, specifying concepts at the EU level, engaging national law enforcement authorities, facilitating procedures in cases of complaints; timely information exchange of data between airlines, airports, and service operators; • the competitiveness of airlines will increase, therefore, the prices for air transport services will be more affordable and will help to increase the demand for air transport; • increasing demand for passenger air transport will help to create new jobs for ground operators, which will also be reflected in an improved level of customer service at the airports.	• threats of terrorism in civil aviation have an indirect impact on the reduction of freight and passenger traffic. High aviation security standards are a prerequisite for the proper functioning and competitiveness of air transport; • military conflicts and economic sanctions imposed on some countries redirect air traffic and limit the number of passenger trips to third countries; • corona virus outbreak – the COVID-pandemic of the early 2020 and 2021 has led to a drastic reduction in passenger journeys, but the recovery process will be of key importance to building action plans in the event of similar events occurring in the future; • unfair actions of agencies which are in charge to help passengers to receive compensations under the Regulations. Such agencies need to be monitored by the national law enforcement authorities in order to minimize fraud cases; • limited airports' capacity – the importance of air transport will continue to increase, leading to exhaustion of airport capacity and adjacent infrastructure.

Source: Concluded by the authors.

5. Evaluating the Impacts of Passengers' Rights Protection Policy on the Competitiveness of Airlines and Airport Operators

Four variants for changing the current regulations have been considered for implementation and their influences have been evaluated by using the impact assessment model of passenger rights policy on the main indicators for airlines and airports performance. By using the dynamic programming approach, each variant is considered with separate sub-options and the benefits in terms of improving the quality of transport services and their influences on the competitiveness of carriers and airport operators are concluded. Based on this assessment, an optimal new variant 5 with the highest impact is derived by using the formula for calculating the maximum efficiency (F) of transport services in terms of measures to protect the rights of air passengers as follows:

$$F = \max\left[V\left(\frac{c.x}{10}\right)\right] \quad (3)$$

where:

F – maximum efficiency

V – options for a different measure to be applied for passenger rights protection and changing EU Regulations

c – weighting factor of the variant

x – weighting factor of the effect.

The relative weighting factors of the expected effects of the measures' implementation can be determined and a cumulative burden of the application effects for each option on the quality of air passenger services and the competitiveness of airlines and airport operators can be determined.

The use of this approach is presented in Table 3. For each option and for each measure included in it, impact weighting factors were calculated and thus, the options with the highest expected effect were assessed.

Table 3

Matrix for determining the effect of the application of different combinations of measures for protecting passenger rights

Variant 1	Variant 2.1	Variant 2.2	Variant 3	Variant 4	Variant 5	Effects b	Weighting factor of the effect x
0.6	0.3	0.3	0.3	0.3	1.2	Safety and Security Regularity and Accuracy Comfort and Culture of Service	3
0.4	0.2	0.2	0.2	0.2	0.8	Right to re-routing	2
0.2	0.1	0.1	0.1	0.1	0.4	Industry fund	1
0.2	0.1	0.1	0.1	0.1	0.4	Care	1
0.4	0.2	0.2	0.2	0.2	0.8	Compensation payments	2
0.2	0.1	0.1	0.1	0.1	0.4	Accommodation in a hotel	1
2	**1**	**1**	**1**	**1**	**4**	Weighting factor of the variant	10/10

Source: Authors' own calculations

In applying the dynamic programming approach, the quality indicators related to security and safety of services, regularity, and accuracy of flights, as well as comfort and culture of service, are combined with a common coefficient as constant and mandatory parameters for compliance in all variants with higher weighting factors. The weighting factors are calculated as suggested by Jain and Gupta (2004) by using the SERVQUAL model based on estimated valuations of some service-quality attributes in an airline choice context using stated preferences methods and adapted to passengers' rights protection policy context by using per cent changes in the consumer perceptions for different variants (Skytrax, 2021). The different weighting factors reflect the examination of variations in values according to different characteristics of the service and the number of measures included in different variants by using the following formula:

$$Wf_i = \sum_{J=1}^{k} P_{ij} \quad (4)$$

where:

Wf_i – weighting factor based on the perceived importance of service quality and other measures for passengers 'i'; k – number of measures/items; P – perception of passengers 'i' with respect to the performance of a service with regards to passengers' rights protection 'j'. The higher the importance of the respective measure (service quality factor), the higher the weighting factor.

Respectively, the weighting factor of each variant is determined by assigning a different value for each effect (formula 3), allowing a clear distinction between possible improvements related to the protection of passengers' rights. The method considers a different number of effects of varying weighting factors, allowing identification of the variant with the highest coefficient. After analyzing the proposals, the effect of the application of different combinations of measures to protect passenger rights is determined.

The coefficients are obtained as multiplication of the weighting factors of the effect (x) and the weighting factors of the respective variant (c), based on which values are assessed for each variant and defined as high, medium, and low. The following assessment scale has been adopted: high – from 0,8 to 1,2; medium – from 0,4 to 0,7; low – under 0,3.

The effectiveness that is obtained for each variant depends on two factors – the measures at the beginning of the relevant stage and the behaviour of the airlines. The second factor is of particular importance, as some airlines justify their delays with exceptional circumstances without any evidence of such delays within the meaning of Regulation (EC) No 261/2004. In the context of the task assigned, the optimal behaviour of the airline carriers means that the greatest possible effect of these variants can be obtained only as a maximum of the coefficients (f).

It is apparent from the matrix that when analyzing air quality indicators, the headline objective is to open up opportunities for improvement with regard to regulations to protect passengers' rights and increase the competitiveness of airlines. Achieving this goal will have a positive impact on the demand for air services – and as a result on the reduction in the cost for compensations to airlines. Thus, a higher transport efficiency, respectively competitiveness of carriers and airport operators, will be achieved.

If the number of variants is V (in this case, V = 6) at $f_i(x_i)$, maximum efficiency of variants 1 and 2, and ..., and j obtained at a set value x and c. Therefore, the option that has the highest coefficients $f_i(x_i)$ by individual indicators is the most effective. The example considered suggested six variants and six effects, one of which is combined and amplified. For each variant, a value is calculated, assessing the effect of its implementation. The highest values give priority to the relevant variant. With constant requirements for compliance with the quality criteria relating to security and safety of transport, regularity, and accuracy of flights, as well as convenience and service culture, the use of the dynamic programming method will make it possible to assess the effect of the application of the different variants based on the different combinations of applicable measures and to choose the option, which ensures the highest economic benefits.

Table 4 presents the four variants examined by the European Commission and proposed to amend the current Regulation (EC) No 261/2004 to improve the application and enforcement of passenger rights, as well as one (variant 5), which is a combination and amplification of measures suggested in other variants. Each of the proposed variants has a different focus and different effects. Common for all variants is the quality of services indicators, which are constant and mandatory in the operation of air transport services without compromising them.

Table 4

Matrix for determining the effect of the application of different combinations of measures for protecting passenger rights

Variant 1	Variant 2.1	Variant 2.2	Variant 3	Variant 4	Variant 5	Measures
√	√	√	√	√	√	Safety and security
√	√	√	√	√	√	Regularity and accuracy
√	√	√	√	√	√	Comfort and culture of services
				√	√	Right to re-routing
			√	√	√	Industry fund
√**	√**	√**	√**	√**	√**	Care
above 5 hours	above 5 hours	above 3 hours	above 3 hours	above 3 hours	above 3 hours	Compensation payments
-	√*	-	-	-	√*	Accommodation in a hotel
2.1	9.8	9.6	11.3	11.6	9.88	Costs by variants (million euro)
8	18.4	17.5	26	26.2	19.22	Maximum costs ***

*Note: * only for long delays over certain hours*
*** flight delay of up to 2 hours*
**** if all passengers entitled bring an action for compensation*
Source: Authors' own calculations

The first variant focuses on the economic incentives for air carriers. It envisages that passengers will not be entitled to re-routing in case of delay of a long flight, but it is mandatory for airlines to offer travel insurance to passengers at their request. This variant

does not provide for the establishment of an industry fund that will cover all the costs of providing care and compensation for passengers. At an earlier stage of the evaluations of the proposed options by the Commission, it was considered that the Fund would be ineffective, and its establishment would lead to additional administrative costs. The time threshold for compensation for flight delay in variant 1 has been changed from 3 to 5 hours. In such an option, passengers will only be entitled to care when the delay is more than 5 hours. The change in the payment of compensations by airlines is similar. Passengers will be able to claim compensation when they arrive at their destination 5 hours late or more. For long delays in this option, hotel accommodation is not included at the expense of the airline. With regards to 'exceptional circumstances', this option proposes a strict definition of events that are not the fault of airlines. The estimated costs of the Commission's estimate for this variant will amount to EUR 2,1 million to cover claims submitted to airlines.

Variant 2 has two sub-variants that are similar to the current Regulation, but the cost of compensation is foreseen to be limited when a higher number of claims for compensations are submitted by passengers. In this option, there will be no industry fund, and in case of delays, regardless of the reason, passengers will be entitled to care. In *variant 2a*, the time threshold for compensations for delays is increased to more than 5 hours, and in *variant 2b* it remains unchanged – for delays of more than 3 hours. Variant 2a includes hotel accommodation for passengers who have long delays of their flights. The current Regulation does not specify an exact definition of long delay. The estimated costs of implementing variants 2a and 2b are similar and amount to around EUR 9.8 million according to the Commission's calculations.

Variant 3 provides for the payment of compensation for delays of more than 3 hours. Measures such as the right to re-routing and hotel accommodation for passengers for delays of more than 3 hours are not included. This variant envisages the establishment of an Industry Fund to cover long-term emergency compensations. In situations of short delays, no right to care for passengers is provided. The estimated cost of this variant amounts to EUR 11,3 million.

In *variant 4*, the compensation threshold is for delays of more than 3 hours, as well as the right to care by the airline in case of shorter delays, is envisaged. In this option, just like in variant 3, an Industry fund is expected to cover compensations for delays of long duration. The difference between the two variants is that under variant 4, passengers can be re-booked with another airline to their destination, with costs covered by the Compensation Fund. No obligation is included for airlines to accommodate passengers in a hotel in case of long delays. The estimated cost of implementing this option amounts to EUR 11,6 million, which is the highest value of the variants under consideration.

Variant 5 (proposed by the authors) is a combination and amplification of the measures suggested in the other variants to protect passenger rights. Passengers will have a right for care in case of a flight delay of up to 2 hours and compensations are paid in case of a delay of more than 3 hours. Passengers will be entitled to re-routing when there are alternative flights to reach their destination with as little delay as possible. With such a choice by passengers, airlines will not have additional obligations to them. These measures apply in cases of overbooked flights, as well. In these cases, the search for volunteers starts at the

check-in desks as early as possible before the flight. Air carriers shall give priority to the transport of persons with reduced mobility and to all accompanying persons. The choice of the passenger who will be denied boarding shall be determined by the end point of travel. If the airline finds suitable alternative flights to reach its destination, the passenger is removed from their original flight and re-routed with another airline. Compensation shall be granted in the form of a cash compensation voucher depending on the distance of the flights and the time of arrival to the destination if the passenger arrives 2 hours or later from the original time of landing. So, the measures envisaged in this variant cover all the cases that could arise when a flight is overbooked. This variant also envisages the establishment of an Industry Fund to cover airline costs when passengers are accommodated in a hotel for long-term delays. The costs of this option are on average calculated based on the other options measures and amount to approximately EUR 9,88 million.

From an economic point of view, variant 1 is the most advantageous, but it has the lowest number of measures that apply to the protection of passengers' rights. The combined option of variant 5 is the next cost-effective one that builds on the European Commission's variants and reflects on improving the quality of the services offered, thereby helping to increase the competitiveness of airlines and airport operators. The main goal of the proposed variant 5 is, on the one hand, to ensure effective and consistent enforcement of air passengers' rights and, on the other hand, *to ensure an increase in the quality of services at optimal costs that will reflect increased competitiveness of airlines and airport operators.* This variant respects the basic principles of the application of the Regulations, as well as it provides for an extension of their scope, which will help to reduce disputes between airlines and passengers in specific cases. This, in turn, is expected to improve the coordination of enforcement policies carried out by the Member States.

6. Expected Impacts of Defined Measures to Protect Passengers' Rights

By using dynamic programming to assess the effectiveness of different variants for improving the air passengers' rights protection policy, a new combined and amplified variant has been developed that has optimal results in terms of the quality of transport services and the competitiveness of airlines and airport operators, based on the coefficients obtained by individual indicators and effects. This option is tailored to passenger rights without further burdening airlines from a financial point of view, while covering passenger losses due to flight delays. The airlines consulted have calculated the costs of paying compensation for delays on an annual basis, amounting to approximately EUR 800,000 (DG MOVE, 2020). The estimated costs of implementing each variant could be used to better decision-making by the European Commission and local law enforcement authorities when choosing a variant. A better solution would be the dynamic calculation of such costs by improving existing passenger re-routing tools. With assistance from other airlines that are members of the same alliance to reach the final destination of passengers, it would also provide airlines with greater savings (Cook, et al., 2009). The study provides estimates of these costs by variants, although more research is needed in this area.

The implementation of the amplified variant and the respective measures to improve the quality of services and protection of air passenger rights, derived by applying the dynamic programming approach, will provide opportunities to reduce delays, to increase airline efficiency, to improve passenger services' quality and to reduce the number of complaints related to flight delays. The necessity for a change in the Regulation on the protection of air passengers' rights is very important in order to increase the competitiveness of airlines and airport operators. The scientific and theoretical results obtained could make a significant contribution to improving the quality of air transport services through the proposed measures to protect passenger rights in different situations. Furthermore, the application of this approach aims to minimize the number of complaints made by air passengers, which has a significant impact on the competitiveness of airlines. The creation of a Compensation Guarantee Fund will help to limit this impact and will lead to lower airfare prices. Consequently, all proposed options for improving air passenger rights policy aim to ensure an improvement in the quality of the services offered by implementing different measures.

6.1. Economic impacts

Each of the proposed variants aims to increase the effectiveness of the passengers' rights protection policy. They provide for systematic checks on the organization of work and the management of the activities of air carriers to be carried out by national law enforcement authorities in the EU countries. The latter should monitor the compliance with the rules included in established action plans to respect the rights of passengers by the airlines in the event of emergencies.

Table 5

Financial impacts of the recommended measures

Impact of the full package of measures compared to the baseline scenario	Total costs at current claims levels (it is assumed that this will increase slowly over time)		Estimate of the maximum costs associated with the application of the Regulation (if all passengers entitled to claim compensation)	
	Net present value (2015-2025), million Euro	% change compared to base line	Net present value (2015-2025), million Euro	% change compared to base line (existing policy measures)
Base line	10.4	-	23.6	-
Variant 1	2.1	-80	8	-66
Variant 2a (unchanged compensation levels)	9.8	-6	18.4	-22
Variant 2b (unchanged compensation levels)	9.6	-8	17.5	-26
Variant 3	11.3	9	26	10
Variant 4	11.6	12	26.2	11
Variant 5	9.88	-15	19.2	-19

Source: Based on the authors' idea and adapted from 'Steer Davies Gleave' study.

As shown in Table 5, coordination between national enforcement policies increases from option 1 to option 5, but the associated administrative costs also increase (Steer Davies

Gleave, 2012). In all policy variants, the existing rights of air passengers are clarified, especially regarding the concept of exceptional circumstances, reducing the possibilities for interpretation.

For variants 2 and 4, the policy is further simplified by introducing the measure, which assumes that the provision of food and drinks is provided whenever a delay of two hours, regardless of the distance of the flight and the reason for the delay.

- *Impact on compliance costs*

Under Variant 1, the compliance costs will be significantly reduced. A long-duration emergency event will have only a limited impact – and costs will remain unchanged for regional carriers. In variant 2 (and its sub-variants), the costs will remain almost unchanged, and their potential for rising will be limited to cases where more passengers claim compensation or in an extraordinary event of a long duration. Costs for regional carriers will be similar to those for other air carriers. For variants 3 and 4, the costs will be similar to the baseline, but with a higher potential for rise in cases where more passengers claim compensation. There will be a cost limit for compensations in case of a long-duration extraordinary event, and costs of regional carriers will remain at very high levels compared to their revenues. Airport operators and other third parties could share some of the costs of air carriers as the above mentioned four variants give air carriers more options to file compensation claims for costs incurred to third parties responsible for delays or cancellations.

In variant 5, the costs are slightly lower than the baseline, provided that the payment of benefits over distances of up to 1500 km is accepted to be reduced from EUR 250 to EUR 200, which would result in a 15 % reduction compared to the basic amount. The estimate of the maximum costs associated with the application of the Regulation would decrease by 19% compared to the baseline if all passengers were entitled to protection claim compensation. The impact on small and medium-sized aviation companies is very limited as only a few of them are affected by the Regulation. Most of them will benefit from the proposed specific measures for small-scale operations (short flights) to variant 2.

All policy options entail some new administrative costs for air carriers (mainly related to the preparation of contingency plans) and national enforcement authorities – mainly related to the implementation of the proactive policy, the costs of which could be offset by a reduction in the number of complaints and respective costs.

6.2. Social impacts

- *Impact on consumers*

From a social point of view, all variants considered have common characteristics: better enforcement of passengers' rights (including baggage); improved procedures of handling individual claims; clarifying and enhancing passenger rights. The measures provided for in variant 1 are aimed at reducing air carriers' obligations to passengers during traffic problems by extending the scope of exceptional circumstances. Although passengers may choose insurance depending on their individual situation, many passengers, in view of the low rate of delays and cancellations, may not properly assess the risk of the occurrence of different

events. In such situations, passengers will not be compensated in the case of possible flight delays.

In variant 2, the obligations to provide care and assistance are increased, but the right to financial compensation is partially limited. It will rely on national enforcement authorities to implement and protect passengers' rights. Moreover, passengers will not be well protected in the event of long-duration emergency events (excluding passengers with reduced mobility) and on regional flights. However, this is offset by better implementation of existing rights.

Variants 3 and 4 envisage many advantages for passengers, such as increasing and better fulfilling of their rights. Nevertheless, the change may result in slightly higher ticket prices, which will contribute to covering the higher performance costs.

Variant 5 includes amplified measures relating to passenger rights in different situations. The establishment of a Guarantee (Industry) Fund proposed in this option will alleviate the financial consequences for airlines but will also cover more situations in case of passenger flight problems. The right to re-routing will help to reduce the number of missed connecting flights and fewer passengers will remain stranded for a long time at airports.

- *Impact on employment*

For the first four variants, impact on the employment remains limited as they are mainly aimed at improving existing passengers' rights protection and better ensuring implementation. In variant 5, the proposed measures can have a positive impact in terms of employment. The reason for this is the extension of passengers' rights, which will improve the overall quality of air transport services and attract greater passenger traffic. This will create prerequisites for the creation of new jobs for the passenger services by ground handling and airport operators, crew, etc. However, it should be considered that the variants of the policy measures applied should not have an adverse impact on the fundamental rights of citizens.

6.3. Environmental impacts

The impact of the proposed policy options to protect passenger rights on emissions remains limited. However, account should be taken of the main objectives of EU transport policy related to the growing concern for environmental protection and reduction of harmful effects. The International Civil Aviation Organization (ICAO) plays an important role in finding solutions to reduce harmful emissions from air transport (Official Journal of the EU, 2014). The EU is trying to establish a market mechanism to achieve zero carbon growth and adopt an environmental certification standard for aircrafts. The environmental parameters of the Single European Sky air traffic management project are expected to contribute to reducing harmful environmental impacts through fuel savings, potentially leading to a decrease of around 50 million tons of carbon emissions. The passengers' rights protection policy as a part of this project could contribute to the achievement of the goal.

6.4. Policy impacts

The Commission envisages a proper assessment of the implementation of new passengers' rights protection policy measures four years after their adoption by the Council and the European Parliament. The annual reports of National Enforcement Authorities will be the main tool for monitoring the level of compliance and coherence of national enforcement policies. It is necessary for the Commission to draw up regular reports on the basis of national reports, complemented, where necessary by its own experience, ad hoc studies, or information from passenger studies. Attention should be paid to the emerging problems identified by national enforcement authorities related to cases of fraud by intermediary agencies for the payment of compensations.

As a result of the systematization of existing problems, it can be summarized that the general objective of the passengers' rights protection policy is to promote the interest of air passengers by ensuring that operators comply with the high level of passenger protection in the event of traffic problems and will operate under harmonized conditions in a liberalized market. This general objective may be decomposed further to the following specific sub-objectives:

- To ensure effective and consistent enforcement of passengers' rights protection across the EU by clarifying definitions and basic principles relating to passengers' rights protection and simplifying rights; effective and coherent sanctioning policy; ensuring an effective complaint handling procedure and legal protection for passengers;
- To reduce the disincentive impact of certain costs on air carriers by ensuring that the obligations of air carriers with regards to passengers' rights cover risks that are limited in time and/or in size; in some cases, financial compensation does not strongly discourage compliance; the Guarantee Fund shall cover the cost for compensation to airlines in situations not entirely caused by the fault of carriers; third parties are encouraged to address the causes of traffic problems for which they are responsible for.

The revision of passengers' rights protection policy measures is of particular importance for the competitiveness of airlines and for striking a fairer balance between the interests of passengers and airlines. Many of the new elements, if adopted, will alleviate the financial costs for carriers, increasing their efficiency and competitiveness. This, in turn, will contribute to improving the quality of the services offered by reducing delays.

Therefore, proposals for amendments to the passengers' rights protection policy will contribute to the development of air transport and, even if adopted, updates will be needed through constant monitoring and analysis of situations that have led to flight delays in order to improve the implementation of the passengers' rights policy. An example is Regulation 0072/2013, which was developed as early as 2013 but is no longer effective enough due to dynamic changes in the air sector.

6.5. Impacts on the aviation industry

One of the main objectives of air transport development policy is to ensure a high level of passengers' protection. To achieve this objective, it is important to take account of what has

been achieved so far and to build on it so as to be able to meet the requirements for the protection of passengers' rights when using air transport. Inconvenience, anxiety, and stress are some of the consequences for passengers in situations of denied boarding, long flight delays or cancellations. It is therefore of particular importance that the EU raises the standards of passengers' protection established by Regulation (EC) No 261/2004 and ensures that air carriers operate under harmonized conditions in a liberalized market.

The passengers' rights protection policy applied was last reviewed in 2013, but without adopting any changes. This means that since 2004 there have been uncertainties and gaps in the scope of the regulations to be filled. The analysis of the Regulation applied provides an assessment and an opportunity to extend its scope through the proposed measures in variant 5 above.

The main priorities of the European Commission's aviation strategy are to keep air transport competitive while maintaining high standards of security and safety. It is necessary to develop an efficiency-oriented risk assessment system aimed at closing existing safety and security gaps. These key air services' quality indicators are important, and the European Commission has planned actions in the areas of creating highly skilled aviation jobs, protecting passenger rights and measures related to air pollution, caused by air transport.

The proposed measures will incentivize airlines to avoid flight delays by optimizing flight plans and providing sufficient time for land handling by ground operators. At the same time, increasing competition is forcing many airlines to reduce their operating costs by outsourcing basic and side-by-side operations to external operators and contractors. This may, on the one hand, reduce the service time of a flight and be more efficient for airlines, but on the other, the service time may not meet the technological minimum, which is a prerequisite for delays and an increase in the number of complaints.

In addition, the implementation of a targeted and systematic policy for the protection of passengers' rights must consider modern trends and conditions of the development of air transport and the emergence of alliances of air carriers. The main benefits of alliances for their members are related to offering an expanded network of destinations through code-sharing agreements; reduced costs due to the sharing of offices, maintenance facilities, operating facilities, catering and computer systems, operational staff – ground staff, check-in staff and boarding points; ensuring investment savings and purchase costs when negotiating additional reductions in the volume of transport. Moreover, the alliances provide the so-called 'sophisticated customers', with more opportunities to make the relationship "company-client" a form of experience beyond the rational framework of market exchange and thus they provide for the resolution of the contemporary challenges for the airlines related to the socially responsible branding and consumer loyalty (Georgieva & Stanimirov, 2021). These benefits provide additional opportunities for alliance members in the enforcement of passengers' rights protection policy and joint solidary liability and assistance to passengers in all cases where their rights have been infringed and claims for liability have been lodged. In this regard, alliances ensure that their members are provided with opportunities to reduce the cost of compensation and to service passengers' rights guarantee processes. All this helps to provide a higher quality of passenger air transport services, to improve the interaction

between carriers in passengers' rights protection procedures and thus, contributes to the high competitiveness of airlines in the air transport market.

7. Conclusions

The most important issue exanimated in this article and the novelty suggested by the authors are related to the application of a dynamic programming approach for evaluation of the impacts of passengers' rights protection policy on the competitiveness of airlines and airport operators. The authors argue that the improvements in the policy for the protection of air passengers' rights could contribute to an increase in the degree of competitiveness of airlines and airport operators. They summarized appropriate measures for the improvements in the passengers' rights protection policy based on the main quality indicators for air transport services and suggesting the usage of a dynamic programming approach for evaluating their impacts on the competitiveness of airlines and airport operators. The main objective fulfilled by using the dynamic programming approach is to ensure effective and consistent implementation of the air passengers' rights protection policy. The authors provide a comparison between different variants for improvements in this policy. They propose a new option to improve the policy by implementing the basic principles with the provision for an extension of their scope to contribute to reducing disputes between airlines and passengers in specific cases, thus providing a decrease in the costs for compensations and additional economic, social, and financial benefits for airlines and costumers. Airlines, airports, air traffic management, ground-handling services and other transport services are interconnected and must cooperate effectively to meet the real demand for flights even in specific situations such as the COVID pandemic.

The implementation of variant 5 as suggested by the authors, including measures for improvement of air passengers' rights protection policy, which also provides for quality improvement measures derived from dynamic programming approach, will help to reduce delays, to increase airline efficiency, to improve passenger service quality and to reduce the number of complaints about flight delays, thus providing lower costs for compensations and other economic, social, and financial benefits to airlines and their clients. The study provides arguments that the need to improve and broaden air passengers' rights protection policy through competitive and clearly justified measures is of particular importance to increase the competitiveness of airlines and airport operators.

The proposed approach for assessing the impacts of passengers' rights protection policy on the quality and competitiveness of airlines and airport operators provides an opportunity to identify individual options for improving this policy according to their effect and financial burden on air transport undertakings and selecting the one that will ensure the achievement of a higher quality of services and that increase the competitiveness of airlines and airport operators.

References

Alamdari, F., Fagan, S. (2005). Impact of the adherence to the original low-cost model on the profitability of low-cost airlines. – Transport Reviews, Vol. 25, N 3, pp. 377-392, https://doi.org/10.1080/01441640500038748.

Bakalova, V., Nikolova, C. (2010). Economics of Transport. Sofia: University Publishing House.

Bao, C. H., Xie, X. Z. (2002). Competitive Strategy and Competitive Advantage. Xinhua Press, Beijing.

Bellizzi, et al. (2018). Air Transport Passengers' Satisfaction: an Ordered Logit Model. – Transportation Research Procedia, Vol. 33, pp. 147-154. https://doi.org/10.1016/j.trpro.2018.10.087.

Bellman, R. (2007). The theory of dynamic programming. – Bulletin of the American Mathematical Society, Vol. 60, N 6. Retrieved November 5, 2020, from https://projecteuclid.org/euclid.bams/1183519147.

Bellman, R., Dreyfus, S. (2015). Applied dynamic programming. Princeton: Princeton University Press. ISBN: 9781400874651.

Carvalho, R. C., Medeiros, D. D. (2021). Assessing quality of air transport service: a comparative analysis of two evaluation models. – Current Issues in Tourism, 24:8, pp. 1123-1138, Retrieved 20 August 2021 from https://doi.org/10.1080/13683500.2020.1765750.

Cvitanić, J., Possamaï, D., Touzi, N. (2018). Dynamic programming approach to principal–agent problems. – Finance Stoch 22, pp. 1-37. https://doi.org/10.1007/s00780-017-0344-4.

Chen, P. T., Hu, H. H. S. (2013). The mediating role of relational benefit between service quality and customer loyalty in airline industry. – Total Quality Management & Business Excellence, Vol. 24:9-10, pp. 1084-1095, https://doi.org/10.1080/14783363.2012.661130.

Cook, A., Tanner, G., Jovanovic, R., Lawes, A. (2009). The cost of delay to air transport in Europe: quantification and management. Abu Dhabi, UAE 27th – 30th June: 13th Air Transport Research Society (ATRS) World Conference. Retrieved November 2020, from https://www.eurocontrol.int/eec/gallery/content/public/document/other/other_document/200905_D2Y1_Cost_of_delay.pdf.

Costa, F. A., Caetano, M., Alves, C. J. P., Rossi, R. (2019). Measuring the Influence of the Commodity Market Performance over the Supply and Demand of Regional Air Travel. – Journal of Aerospace Technology and Management, Vol. 11/1219. https://doi.org/10.5028/jatm.v11.1014.

Curry, N., Gao, Y. (2012). Low-Cost Airlines – A New Customer Relationship? An Analysis of Service Quality, Service Satisfaction, and Customer Loyalty in a Low-Cost Setting. – Services Marketing Quarterly, Vol. 33:2, pp 104-118. Retrieved on 19 August 2021 from https://doi.org/10.1080/15332969.2012.662457.

D'alfonso, T., Nastasi, A. (2014). Airport-Airline interaction: some food for thought. – Transport Reviews, Vol. 34:6, pp. 730-748, https://doi.org/10.1080/01441647.2014.971470.

Deming, W. E. (2018). The new economics : for industry, government, education. 3rd ed. Cambridge, Massachusetts. ISBN 978-0-262-03900-0.

DG MOVE. (2020). Airport capacity and quality. Retrieved December 2020, from https://ec.europa.eu/transport/modes/air/airports/airport_capacity_and_quality_en.

European Commission. (2014). Report on the proposal for a regulation of the European Parliament and of the Council amending Regulation (EC) No 261/2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of. Retrieved 5 5 2020 from: https://www.europarl.europa.eu/doceo/document/A-7-2014-0020_EN.html.

European Commission. (2017). Aviation Strategy for Europe. Retrieved 23.6.2020 from https://www.europarl.europa.eu/doceo/document/A-8-2017-0021_EN.html#title1.

European Commission. (28.03.2011). Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. Retrieved 20 March 2020 from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:BG:PDF.

European Court of Auditors. (2021). Air passenger rights during the COVID-19 pandemic: Key rights not protected despite Commission efforts. Luxemburg. Retrieved 23 August 2021 from: https://www.eca.europa.eu/Lists/ECADocuments/SR21_15/SR_passenger-rights_covid_EN.pdf.

Farias, D. P., Van Roy, B. The Linear Programming Approach to Approximate Dynamic Programming. – Operations Research Journal, Vol. 51/6, pp. 839-1016. https://doi.org/10.1287/opre.51.6.850.24925.

Gallego, I., Font, X. (2021). Changes in air passenger demand as a result of the COVID-19 crisis: using Big Data to inform tourism policy. – Journal of Sustainable Tourism, Vol. 29:9, pp. 1470-1489, https://doi.org/10.1080/09669582.2020.1773476.

Georgieva, M., Stanimirov, E. (2021). Marketing Projections of Socially Responsible Branding on Consumer Loyalty. – Economic Studies, N 4, pp. 23-52.

Jain, S. K., Gupta, G. (2004). Measuring Service Quality: Servqual vs. Servperf Scales. – Vikalpa: The Journal for Decision Makers, Vol. 29, N 2, pp. 25-38. https://doi.org/10.1177/0256090920040203.

Lim, J., Lee, H. C. (2020). Comparisons of service quality perceptions between full-service carriers and low-cost carriers in airline travel. – Current Issues in Tourism, 23:10, pp. 1261-1276. Retrieved on 17 August 2021 from: https://doi.org/10.1080/13683500.2019.1604638.

Martín, J. C., Román, C., Espino, R. (2008). Willingness to Pay for Airline Service Quality. – Transport Reviews, Vol. 28:2, pp. 199-217. Retrieved 19 August 2021 from https://doi.org/10.1080/01441640701577007.

Mutafchiev, L. (1995). Issues in air transport economics. Sofia: University Publishing House.

Mutafchiev, L. (1997). Economic analysis of transport enterprises. 3rd ed. Sofia: University Publishing House.

Mutafchiev, L. (1999). Econometric and mathematic methods and models in transport. Sofia: University Publishing House.

Mutafchiev, L. (2003). Economic analysis of transport enterprises. Sofia: University Publishing House.

Nanfoso, R. T., Hadjitchoneva, J. (2021). The European Union Facing the Challenges of Globalization. – Economic Studies, N 5, pp. 27-48.

Neil Curry, Yuhui Gao. (2012). Low-Cost Airlines – A New Customer Relationship? An Analysis of Service Quality, Service Satisfaction, and Customer Loyalty in a Low-Cost Setting. – Services Marketing Quarterly, 33:2, pp. 104-118, DOI: https://dx.doi.org/10.1080/15332969.2012.662457.

Nikolova, C. (2017). Air transport in Bulgaria. Sofia: University Publishing House.

Official Journal of the EU. (16.04.2014). eur-lex.europa. Retrieved 14. 5. 2020 from https://eur-lex.europa.eu/legal-content/BG/TXT/?qid=1558510805756&uri=CELEX:32014R0598.

Park, J. H., Robertson, R., Wu, C. L. (2006). Modelling the Impact of Airline Service Quality and Marketing Variables on Passengers' Future Behavioural Intentions. – Transportation Planning and Technology, Vol. 29:5, pp. 359-381, https://doi.org/10.1080/03081060600917686.

Skytrax. (2021). COVID-19 Airline & Airport Safety Rating. Retrieved on 25 August 2021 from https://skytraxratings.com/covid-19-airline-safety-ratings.

Steer Davies Gleave. (2012). Revision of Regulation 261/2004. Retrieved May 2020, from https://ec.europa.eu/transport/sites/transport/files/themes/passengers/studies/doc/2012-07-exploratory-study-on-the-application-and-possible-revision-of-regulation-261-2004.pdf.

Wehner, C., et al. (2018). State of the art of pricing policy in air transportation: network carriers vs. low-cost airlines. – Tourism & Management Studies, Vol. 14(3), pp. 32-40. Retrieved on 15 August 2021 from http://dx.doi.org/10.18089/tms.2018.14303.