

IC56 market investigation

**PRICING ALGORITHMS IN PASSENGER AIR TRANSPORT ON  
DOMESTIC ROUTES TO AND FROM SICILY AND SARDINIA**

**Final report**

**16 December 2025**

*This document is published for information purposes only:  
the Final Report and the related decision  
are the only documents with official value.*

## EXECUTIVE SUMMARY

In November 2023 the Authority launched a market investigation into the use of pricing algorithms in passenger air transport, and into the transparency and comparability of fares on domestic routes to and from Sicily and Sardinia. In November 2024 the Authority published a Preliminary Report presenting the key findings gathered up to that point. Subsequently, comments were received from various stakeholders, including airlines and consumer associations. On 16 December 2025 the Authority closed the market investigation. The overall findings of the investigation are set out in the Final Report.

As stated in the decision opening the market investigation, the assessment focused on the extent to which pricing algorithms are used within the revenue management systems employed by airlines on routes to and from Sicily and Sardinia. It also aimed to assess their main features and potential effects in hindering and/or distorting competitive dynamics. The investigation also examined whether airlines apply differentiated or personalised air fares, including through the use of pricing algorithms, which may harm consumers. In addition, the inquiry analysed how air fares are communicated to the public. These disclosure practices affect both price transparency and comparability and may influence consumers' purchasing decisions and mobility of demand, with possible implications for competition in the sector.

### *Algorithms and prices*

Airlines widely use sophisticated revenue management systems to set prices. These systems are designed to maximise revenue by adjusting the fares of individual flights over time based on factors such as load factors, actual demand compared with forecasts, and the time between booking/ticket purchase and departure.

The investigation examined how pricing algorithms are used in airline revenue management systems. It looked at whether, and under what conditions, these algorithms may negatively affect the way air transport services are offered to consumers. In particular, it assessed potential risks to competition and possible harm to consumers, with a specific focus on routes to and from Sicily and Sardinia.

At the outset of the investigation, the primary competition concern was that pricing algorithms could facilitate collusive outcomes. By processing large volumes of data and enabling more frequent reactions to competitors' pricing decisions, such algorithms could make collusion easier to achieve or sustain.

Another concern related to the potential negative effects of pricing algorithms on consumer welfare. In particular, the use of advanced customer profiling and price discrimination techniques could allow airlines to define increasingly narrow consumer groups, potentially down to fully personalised pricing. This would move outcomes closer to first-degree price discrimination, which may be socially undesirable as it transfers the entire consumer surplus to producers. Evidence of such strategies could raise concerns, especially in the context of assessing potential abusive conduct.

Finally, the investigation examined the effects of the forms of price discrimination most commonly used in the air transport sector, in particular intertemporal price discrimination. This practice involves varying prices over the entire booking period of a flight (so-called dynamic pricing). Its effects on consumer welfare may not be clear-cut.

To examine the issues outlined above, the investigation relied on a range of tools. These included requests for information addressed to the main airlines operating on the routes under review. The requests also sought to gather information on the key features of the pricing algorithms used in their

revenue management systems. In addition, and in line with OECD best practices, the investigation made use of algorithmic auditing techniques. These methods aim to infer how algorithms operate by analysing their outcomes, in particular the prices actually applied. To assess whether personalised pricing practices were in place, the investigation applied a sock-puppet auditing approach. This method is based on the creation of fictitious users to simulate consumers' interactions with websites. The investigation also carried out an analysis of the prices actually charged by airlines as a result of the use of algorithms. This analysis relied on a dataset of more than 20 million ticket prices per individual route. The dataset made it possible to examine price trends, including on a daily basis, both in the markets under investigation and in a set of comparable markets used as benchmarks. Comparing these markets helped assess whether routes to and from Sicily and Sardinia display any specific features.

The analysis revealed that the revenue management systems employed by airlines are still largely based on 'traditional' approaches. These systems rely on fare classes defined in advance by airline management. Tickets are then allocated to a specific fare class based on demand conditions and load factors. On the other hand, Artificial Intelligence (AI) and Machine Learning (ML) are not widely used yet. That said, a number of carriers are currently testing these technologies, albeit on a limited scale and only for specific functions, services and/or routes. As a result, their wider adoption in the air transport sector cannot be ruled out in the near future.

The investigation also found that airlines use revenue management systems that differ significantly from one another. These differences concern how the systems operate, the number and features of algorithms used, the data they process, and how often and in what ways analysts intervene manually.

The sock-puppet audit did not find clear evidence of customer "profiling" aimed at personalising prices based on the type of device, the operating system or browsing history. Air carriers were, however, found to use A/B testing techniques in some cases. With this approach, aimed at estimating demand elasticity, airlines offer two or more prices for the same flight (or ancillary service) at the same time and assign them randomly to users. Whether this practice raises concerns for competition or consumer protection depends on several factors. These include the specific features of the practice, how widely it is used, and, under certain circumstances, what information is given to consumers.

The analysis of actual ticket prices first looked at how prices change over the year, what average prices passengers pay, and how fares vary as the departure date approaches (intertemporal discrimination).

A closer look at daily price data showed that, on routes to and from Sicily and Sardinia, a significant share of passengers paid fares above €150 – and in some cases above €200 – for a one-way ticket during certain periods and days of the year with increased demand, especially around public holidays and during the summer season.

In particular, during the summer, prices exceed €150 for a significant share of passengers (around 30%) on certain days in early August for inbound flights to the islands and on certain days in late August for outbound flights from the islands. In addition, on several days in June and July and in the first half of August, a significant share of passengers pays fares above €100 per one-way trip, especially on flights to the islands.

The days around Christmas show the highest share of passengers paying fares above €150 for a one-way ticket to Sicily (more than 50%), with many passengers paying prices above €200. On the same days, flights departing from Sicily are instead characterised by lower fare classes and lower load factors, suggesting that travel demand is largely one-directional. As for return flights after Christmas, prices are higher than in other periods, but the share of passengers paying fares above €150 is lower than for the first flight in the itinerary. This is likely because demand for return flights is spread over more days.

For flights to Sardinia, fares above €150 affected a relatively smaller share of passengers (around 10-15%) in the days around the main Christmas and New Year holidays (this share is even lower for return flights), likely also reflecting the presence of passengers benefiting from reduced fares under public service obligations (PSOs).

Looking at data for the whole of 2023, the average one-way ticket price for flights to and from Sicily and Sardinia was around €70. The vast majority of travellers (around 80%) paid less than €100. Price peaks therefore appear to be limited to few periods of the year and affect only a very small share of the tickets sold overall.

During the investigation, airlines explained that their ability to increase flight capacity during peak periods is constrained by a number of factors. Capacity planning is generally carried out at network level and over a time horizon of at least several months (based on IATA-defined seasons) to optimise aircraft use (by maximising hours flown and load factors). By contrast, peak periods are usually limited to a few days. Therefore, according to air carriers, it would be difficult to forecast capacity increases for such a short time span. It would also be difficult to increase capacity by moving aircraft from one route to another, since peak demand days tend to occur at the same time across all routes of the network operated by each air carrier.

In this context, territorial continuity policies may mitigate prices also during peak periods, to the benefit of residents and similar categories (whose demand can be less elastic than tourist demand). Among these policies, public service obligations (PSOs), which require airlines to meet certain requirements in terms of frequency, seat availability and prices (in some cases against compensation) or social aid, in the form of discounts/refunds on the ticket price paid directly to passengers, represent the most important ones.

It should be noted that PSOs are an exception to the principles of competition and pricing freedom set out in Regulation (EC) No. 1008/2008 on air transport, and that they may affect the competitive functioning of markets. Against this background, a State seeking to impose PSOs on a given route must assess whether they are necessary and adequate, in line with EU law principles.

The process for the adoption of a PSO programme requires Member States to liaise with the European Commission. Experience at the Ministry of Infrastructure and Transport (MIT) in this respect shows that, although this is not systematic, the Commission has regularly raised objections to the extension of fare concessions to non-residents, a practice it has viewed unfavourably particularly from 2018 onwards. According to the MIT, the European Commission should reconsider this approach and allow for the application of fare concessions to non-residents as well, possibly with higher fare caps than those for residents.

In Sardinia, PSOs apply to all the main connections with the mainland. In addition, at the end of 2023, social aid – in the form of ticket price discounts or refunds – was introduced on routes not covered by PSOs. In Sicily, PSOs currently apply to routes between the minor islands and Sicily. On 1 November 2025, territorial continuity was also introduced on routes from Comiso to Milan Linate and Rome Fiumicino. Residents may also benefit from social aid on connections to and from the mainland.

In both Sardinia and Sicily, there is growing interest in extending territorial continuity policies to a broader group of beneficiaries, so as to include – alongside residents and business travellers – other categories of users who are in some way connected to the territory. For example, in December 2024, the Sicilian Region introduced a measure that, during the Christmas holiday period, extended eligibility for the social aid launched in 2023 beyond residents to include people born in Sicily. In Sardinia, the new PSO framework now being rolled out extends fare concessions to additional user groups and

introduces capped fares for non-residents with family ties (up to the third degree) to Sardinian citizens, or who provide care to family members under Law No. 104/92.

The analysis of actual prices also focused on the impact of PSOs in Sardinia, highlighting that passengers benefiting from PSO fare concessions pay, on average over the year, slightly lower prices than non-PSO passengers travelling on the same flights. Monthly data show that PSOs help contain prices, especially during peak periods, but mainly for residents and equivalent groups. During the low season, market prices can at times fall below PSO discounted fares.

In Sardinia's O&D markets that include PSO routes, carriers operating solely under free-market conditions are generally also present. In these markets, prices for non-PSO passengers tend to be lower than in markets served only by PSO-regulated operators.

Looking at the intertemporal price discrimination strategies typical of the airline industry (dynamic pricing), the analysis of actual ticket prices applied to the routes under review showed that prices decrease as the time between purchase and departure increases. For example, buying a ticket to/from Sicily over one month in advance allows passengers to save on average around 53% compared to the price paid during the week prior to departure. Buying tickets in advance leads to savings also during peak periods, even though the starting price is higher due to higher demand. Moreover, for the same flight date, these savings vary significantly depending on the chosen combination of departure time, airport and carrier.

The analysis also revealed that intertemporal price discrimination tends to be lower where the average prices are higher. On the other hand, such intertemporal discrimination tends to be higher where average prices are lower. During peak season and peak periods, basic fares and average fares are higher, while prices vary less based on how early the booking is made. Conversely, in the low season, both basic fares and average fares are lower, while intertemporal price discrimination is higher. In this respect, although intertemporal price discrimination leads to higher prices close to departure – especially during peak season – it also makes lower prices available for advance bookings, to varying degrees over the year.

On an annual basis, tickets are generally purchased on average over 30 days in advance of the departure date. This figure increases significantly during the summer months and, to a lesser extent, in December and in April/May, while it declines during the winter low-season months. In addition, a survey conducted by Doxa on a sample of consumers who travelled on the routes under review showed that 60% of consumers purchased their ticket more than one month before the departure date, whereas only 12% made the purchase in the week immediately before departure.

The analysis of actual ticket prices also examined the pricing dynamics of individual carriers operating on the routes under review. The analysis showed that carriers apply different pricing strategies in terms of price levels, the allocation of tickets across fare classes and intertemporal price discrimination strategies. Accordingly, load factors and average revenues also differ across carriers.

In particular, average prices vary significantly across carriers, with the highest average price up to around 80% higher than the lowest in the same market.

Moreover, carriers employing low-cost strategies charge lower average prices, use more intensive intertemporal price discrimination, and record higher and less dispersed load factors. By contrast, more traditional carriers apply less dynamic pricing strategies, with higher average prices and load factors that tend to be lower and more dispersed.

The differences in pricing strategies across carriers observed in the analysis of actual prices are fully consistent with the presence of differentiated revenue management systems across airlines.

Alongside the analysis of actual prices, the investigation also examined the structural features of the markets, finding that they are relatively concentrated and characterised by a limited number of operators. At the same time, the markets show clear signs of dynamism, including operator turnover (linked both to changes in PSO awards and to entry into and exit from individual markets) as well as shifts in carriers' relative positions over a multi-year time horizon.

In addition to examining routes to and from Sicily and Sardinia, the analysis of actual prices also focused on comparable markets used as benchmarks, to assess whether the routes under review display any specific features.

A comparison with the benchmark markets (Insular alike) did not reveal any route-specific features, in terms of the level and distribution of tickets sold by fare class, even in peak periods. Some of the specific features observed for routes to Sardinia seem to reflect the presence of PSOs. Each carrier applies the same revenue management system across all the routes it operates, with no route-specific adjustments for connections to and from the major islands, in terms of pricing criteria, systems, and mechanisms.

Overall, the investigation into domestic routes to and from Sicily and Sardinia did not reveal collusive outcomes with regard to the functioning of pricing algorithms and actual price dynamics (which could be linked to the possible presence of parallel conduct among carriers).

In this context, although territorial continuity policies – particularly PSOs – represent a departure from the principle of free competition, they can help mitigate prices for certain consumer groups with limited demand elasticity, including during price peaks.

#### *Transparency and comparability of air fares*

The market investigation showed that consumers face difficulties in adequately comparing air fares. They are thus unable to fully benefit from price differences – at times significant – applied by different air carriers on the routes to and from Sicily and Sardinia. This has implications for competitive dynamics. Indeed, transparency and comparability affect mobility of demand, especially for complex services like passenger air transport nowadays. This, in turn, affects prices and incentives for operators to compete.

Following the liberalisation of air transport services, airlines have adopted increasingly sophisticated and differentiated commercial strategies. These include, in particular, the option to purchase only the basic transport service or to add one or more ancillary services – such as baggage or seat selection – either as part of predefined bundles or as add-ons to the basic fare (unbundled mode). This has expanded the range of options available to consumers when purchasing an air ticket and helped broaden access to air transport services, including for passengers with more limited financial means. However, the investigation revealed that these developments have also increased the complexity of consumers' decision-making process and made it more difficult to compare air fares, especially with regard to the prices of ancillary services.

The investigation found that a considerable share of passengers on the routes under review also purchased ancillary services, as part of predefined bundles or as add-ons to the basic fare. There is therefore a sizeable group of users interested in buying not only the basic transport services offered by airlines, but also the ancillary services, whether bundled or unbundled.

The survey carried out by Doxa showed that most consumers buy tickets from the websites of airlines. Furthermore, most interviewees (60%) compared air fare prices before purchasing a ticket, through a number of flight searches (in many cases more than 4).

The investigation also involved the simulation of flight searches on the websites of airlines operating the routes to and from Sicily and Sardinia. These searches revealed that prices are presented largely in a similar manner: the first page of the flight search results only displays the basic fare option (or the default fare inclusive of carry-on baggage). Immediately after that, consumers are shown the predefined bundle options, which also include one or more ancillary service (seat selection, checked baggage, carry-on baggage, flexibility options). It is only at a later stage, during the booking process, that consumers are shown the individual ancillary services with the relevant price, which can be purchased in addition to the basic fare option or to a bundle (unbundled mode).

The findings also indicate that the bundles may be oversized in relation to consumer needs, either because they include more ancillary services than a consumer would otherwise purchase (e.g., both checked baggage and seat selection) or because the types of ancillary services included in the bundle are of higher quality than the standard ones (e.g., the bundle may include a more spacious, premium-category seat rather than a standard seat). In these cases, buying the bundle may cost more than purchasing the basic fare and ancillary services separately. To determine which option is better for consumers, bundle prices should therefore be compared with the cost of buying the basic fare plus one or more ancillary services on an unbundled basis.

Another finding concerned the airlines' practice to request personal data during the booking process, before offering one or more unbundled ancillary services, instead of requesting such data at the end of the booking process. Even allowing for certain operational needs cited by carriers, this practice also increases search costs and makes comparisons more difficult, both across different carriers and within the offers of the same carrier.

The pricing communication practices observed among carriers can be traced back to the concept of drip pricing. This practice involves advertising a main price at the start of the purchasing process and disclosing additional costs – in this case, flight ancillary services – incrementally, or 'drip by drip', only as the purchase process progresses. In this respect, the economic literature shows that drip pricing is an obfuscation strategy that can adversely affect competitive conditions. By increasing consumers' search costs, it reduces their willingness to switch and weakens competitive pressure, potentially allowing firms to keep prices higher than they would be in a competitive market.

Given the current structure of the booking process, a consumer wishing to compare the price of a carrier's predefined bundle with its unbundled option, as well as with the bundled and unbundled offers of other carriers, must repeat the booking process separately for each carrier. This involves building a customised basket combining the basic transport service with the selected ancillary services – a complex task that requires multiple clicks each time. The consumer must then record, for each carrier, the price of the basic fare, the composition and prices of the various bundled offers, and the unbundled prices of ancillary services, before carrying out calculations and comparing the bundled and unbundled offers across carriers.

The process required to compare air fares is therefore rather complex and burdensome for consumers, in terms of effort and time spent searching for the best price solution. If the effort and time required to compare flights are perceived as excessive relative to the benefits, consumers may stop comparing offers altogether and buy a ticket that does not best meet their needs (or offer the best value for money).

In conclusion, for the reasons outlined above, the way in which air fares are currently presented on the websites of carriers operating routes to and from Sicily and Sardinia is problematic, as it hinders

effective comparison across the range of available offers. In particular, it limits consumers' ability to compare ticket prices that include ancillary services and to assess whether bundled options offer better value than purchasing the basic fare together with ancillary services separately. Due to search costs, consumers may be discouraged from thoroughly comparing offers, even though a variety of prices are available and prices across carriers differ. As a consequence, mobility of demand is reduced and there are fewer incentives for companies to compete on price, leading to negative effects on competition between carriers.

The investigation showed that metasearch engines can help consumers considerably in their search for flights and fare comparison, by reducing search costs and increasing the mobility of demand, to the benefit of competition. Overall, metasearch platforms allow effective comparison of basic air fares, but are less effective in enabling comparisons of ticket prices that include ancillary services. This is because the information provided to consumers is limited to a small set of ancillary services (mainly baggage) and differs across carriers, making effective comparison across offers more difficult.

Improving the comparability of air fares and competition in air transport markets may call for changes to the way prices are currently presented on carriers' websites. This could be achieved by showing the unbundled price of one or more among the main ancillary services (checked baggage, carry-on baggage, seat selection) together with the price of the flight on the first page shown following a flight search.

This would give consumers immediate access to the information required to compare offers with ease. With fewer clicks than are currently necessary, consumers would be able to compare offers across carriers and within a single carrier, including when buying unbundled ancillary services and when comparing their price with that of bundled options.

Such a change could also contribute to further improving comparisons made through metasearch platforms. It may be worth considering expanding the dataset regarding air fares available to metasearch engines. This would allow consumers to better compare the prices of the main ancillary services.

Airline offers and the way they are presented do not represent a feature specific to routes to and from Sicily and Sardinia but are instead a common feature, at least across the majority of national and/or intra-European flights: carriers apply the same sales and price-presentation methods on their websites across their entire route network.

As a result, any initiatives aimed at improving the comparability of air fares should apply to air routes across the whole of Italy in general and to all intra-European services. This would prevent fragmentation of the competitive landscape and grant consumers access to equivalent data for different routes.

It is worth noting that the European Commission is currently revising Regulation (EC) No. 1008/2008 on air services. Said Regulation also governs how air fares are made known and provides that air carriers are free to set air fares for their services (art. 22) provided they comply with certain obligations on how air fares are communicated to consumers (art. 23).

After several intermediate steps, the Commission launched a call for evidence in May 2025. Many stakeholders took part, including consumer associations. These stakeholders highlighted the need to introduce rules that would make it easier for consumers to compare offers, in particular with regard to ancillary services. The Commission then opened a public consultation, which closed in mid-December 2025. In one of the problems under review ("*Problem 5: Customers are not always able to make fully informed choices on air tickets*"), the consultation points to difficulties in comparing prices ("*The*

*evaluation concluded that current price transparency rules do not seem to enable effective price comparison for passengers given the increasing use of optional price supplements. Airlines apply different pricing models, and categorise their optional price supplements differently”). One of the policy options put forward for consultation is to “require the price of optional price supplements to be displayed next to the fare”.*

In light of the ongoing review of the Regulation, the Authority liaised with the European Commission services on the issues identified with regard to the transparency and comparability of air fares. In the context of these exchanges, the Commission services first of all noted that the Authority’s investigation “*touches on a very important topic for passengers not only in Italy but across the European Union, namely the comparability of airfares*”.

The Commission services also highlighted that “*Regulation (EC) No 1008/2008 provides for the final price of air fares and air rates available to the general public to be indicated at all times, including all unavoidable and foreseeable price elements. Optional price supplements shall be communicated in a clear, transparent and unambiguous way at the start of any booking process and their acceptance by the customer shall be on an ‘opt-in’ basis. However, [...] changes in business models since the adoption of the Regulation, including the increasing unbundling of ancillary services, make it difficult for passengers to easily compare prices at the start of the booking process. This applies not only for bookings via airline websites, but also through comparison sites such as online travel agents and meta-search engines.*”

It was also noted that “*the call for evidence for the review of Regulation 1008/2008, published in May this year, identified difficulties for customers in not always being able to make fully informed choices about air tickets*”. The Commission invited the public and stakeholders to provide their feedback on this and other issues, through a public consultation which was open until 15 December 2025.

In this context, the Commission services noted “*the importance of a common EU solution, so as not to lead to fragmentation of different rules applying for services to, from or within different Member States. A common solution is also in the best interests of passengers, since it ensures that the same information will always be available, irrespective of residence, nationality, or where the air services are being operated*”.

The Authority will contribute to the ongoing review of Regulation (EC) No. 1008/2008 by sharing with the Commission the findings of this investigation and its related assessments.