Air connectivity in remote regions

A comprehensive review of existing transport policies worldwide

Xavier Fageda[a], Ancor Suárez-Alemán[b], Tomás Serebrisky[b], Reinaldo Fioravanti[b]

a Universitat de Barcelona, Spain
b Inter-American Development Bank, USA

Abstract

A consensus exists in the literature on the strong link between air connectivity and economic growth and development. The need for connecting people and markets is part of national policies in different territories. The existence of remote areas, that is, those that under strict market criteria would not be transport supplied due to lack of commercial profitability, has led to the development of different public policies aimed to support air connectivity in regions where commercial airline operations are not viable. This paper provides a mapping of existing policies applied worldwide to provide air connectivity to remote areas, and critically reviews policies promoting air connectivity, including: 1) route-based policies; 2) passenger-based policies; 3) airline-based policies; and 4) airport-based policies. This effort is the first to compile and critically analyze all the existing alternatives to provide air connectivity in remote areas and to report on experiences worldwide. Moreover, we develop a novel taxonomy of existing public policies when it comes to providing air connectivity to remote areas. After reviewing different policy options and instruments applied globally, the paper ends with a policy discussion.

Key Words: air transport; public service obligations; air connectivity; remote regions.

1. Introduction

The provision of air connectivity represents a key factor for a region's integration and development.[1] According to the International Air Transport Association–IATA (2016), air passenger demand worldwide has experienced a 3.7% annual compound average growth rate over the last decade. The spectacular growth in the international air transport market and the accompanying development of new markets has greatly contributed to improved global connectivity.

[1] The key role played by air transport in trade and development outcomes across countries is well documented (Arvis and Sheperd, 2011). Authors point to the importance of air transport in promoting efficient delivery times, consistency of deliveries, and reasonable transport costs, thus enhancing product competitiveness on international markets. The more favorable trade outcomes support higher GDP growth, with the added benefit of global citizens having better access to goods and services, including from remote locations.

Given the link between air connectivity and trade and development, policymakers are keenly interested in appropriate mechanisms to effectively promote air transport to remote areas otherwise excluded under normal markets conditions. Indeed, not all routes are economically interesting for airlines. Sometimes we find regions, communities, or routes where free-market conditions would not facilitate the development of proper transport connections. This is due to the inherent nature of air transportation costs, which are subject to high fixed costs of operation, allowing supply only at relatively high levels of passenger transport. Achieving economies of scale is least likely in routes to / from remote areas.

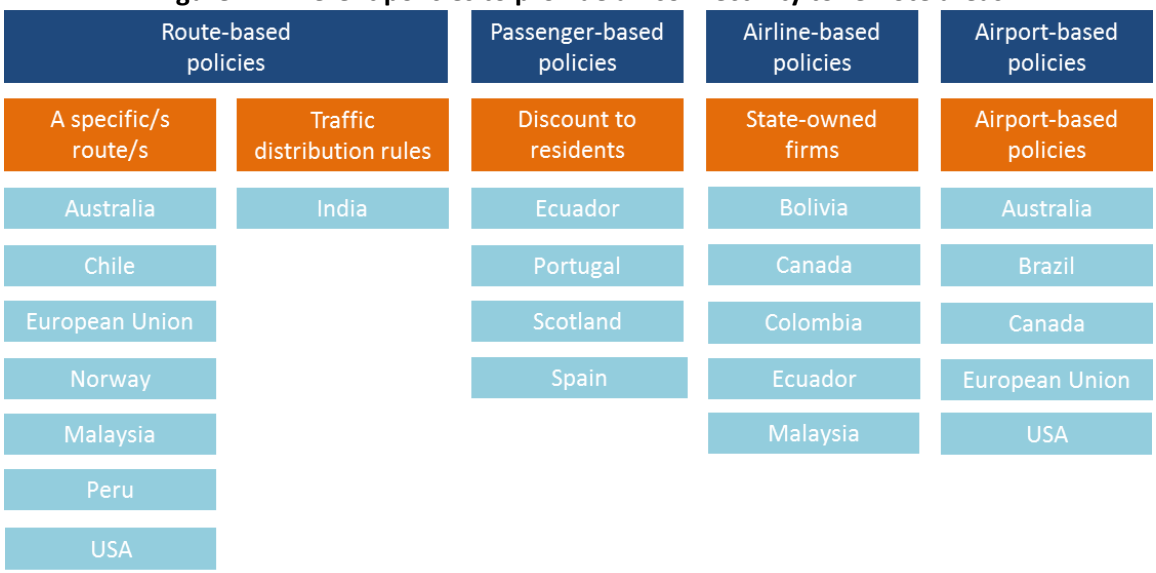
Given the nature air transport supply, remote regions, isolated communities, and non-commercial routes or destinations all represent causes for the establishment of policies aimed to provide air connectivity to places that under normal circumstances would have lacked them. It can be argued that air transport services are a social right of inhabitants. In practice, Public Service Obligations (PSOs) in Europe and Essential Air Services (EASs) in the U.S. represent the most documented policies. Many other countries engage in these policies as well, but there are generally less specifics on these policy schemes.

While there is no unambiguous definition of "remoteness" when it comes to air connectivity (and governments use terms such as remote region, isolated communities, essential services, and non-commercially viable interchangeably), we can agree that all related policies involve situations where there is a claimed need for third party involvement, that is, the public sector, to provide a service and connect a region or community. This is most often accomplished by means of subsidies from the central government or local authorities (Bråthen and Halpern, 2012). Following related literature, in this paper we employ "remote areas/regions" to refer to all abovementioned realities.

Like the definition of remote area itself, policy-specific objectives differ widely across the known experiences. In some cases, the priority is to guarantee "lifeline services" in areas with difficult terrain or weather, where land transportation is not a real option due to the distance to the closest urban center. In other cases, the focus is to guarantee the connection with the national air transport system in places that are not able to generate sufficient demand to attract commercial services by airlines. Other policies guarantee a minimum supply of domestic flights in cases where flight frequencies are necessary but are low in the off-peak season or during certain times of the day (i.e., non-commercially viable). Alternatively, the policy objective may be to promote national cohesion by sustaining air services in sensitive areas such as outermost territories, islands, or regions with political demands.

A varied set of policies have been implemented around the world to support air services in the abovementioned cases where commercial operations by airlines are not viable, including from the initial experiences of PSOs in Europe and EASs in the U.S., to the most recent cases of Peru or Colombia, among others. Although they all have a similar philosophy – providing air connectivity to what each government considers a remote area– they all have remarkable differences and impacts from a public policy perspective. In this sense, the choice among alternative policies becomes a difficult task. After reviewing experiences worldwide, we group these policies in the following categories: 1) route-based policies; 2) passenger-based policies; 3) airline-based policies; and 4) airport-based policies. Note that some countries may have a combination of these policies addressing air connectivity in remote regions, as will be discussed later. Figure 1 maps the main policies used to provide air connectivity to remote regions and some country examples – that will be specifically analyzed in the next sections – in the application of the different schemes.

Figure 1. Different policies to provide air connectivity to remote areas



Source: authors.

2. Route-based policies: the most widely used instrument to link remote areas

The most widely used instrument to provide connection to isolate communities worldwide is the imposition of public service obligations (PSOs) in specific routes. Previous literature has focused on PSOs, which represent one of the alternatives that governments have at their disposal to provide connectivity (Williams and Pagliari, 2004; Calzada and Fageda, 2012; among many others). This policy option has been implemented in countries where the aviation market is fully deregulated; prime

examples of the imposition of PSOs are in the United States, country members of the European Union, and Australia. While the details of PSOs vary by country, PSOs are short-term contracts set by the government with airlines that may specify the service levels, including flight frequency, the type of plane, scheduling, and fares to be offered in the route. In return for meeting these requirements, an airline may receive a subsidy, and it is usually protected from the entry of other airlines.

There are a variety of elements to analyze regarding the specific implementation of these policies. We may characterize route-based policies according to 1) the scale of the program; 2) the institutional framework; 3) the eligibility criteria for regions; 4) the selection criteria of carriers; 5) the service levels and fares; and 6) the scope of competition. Table 1 summarizes these variables and their different dimensions. This section follows this scheme to further compare policy options and adequacy of the instruments based on a comprehensive review of all known experiences worldwide.

Table 1. Variables and dimensions to articulate policies to provide air connectivity to remote areas

Scale of the program	Number of routes served, amount of resources allocated
Institutional framework	Central government, regional government, local communities
Criteria for eligibility of regions	Use of specific or discretional rules, density of traffic, opportunities for intermodal competition, network or point-to-point links
Criteria for selection of carriers	Voluntary, decentralized in the communities, competitive
Adequacy of service levels and fares	Frequencies, fares, load factors, type of aircraft
Scope of competition	Entry restricted or not, potential number of bidders, objective or discretional criteria to select carriers

Source: authors.

Tables A1 and A2 in the annex provide some details of the PSO programs applied in different countries. The main programs in terms of number of routes served and the amount of resources spent can be found in the U.S. and the European Union. Hence, we provide more details of the schemes implemented there.[2] Note that these have also been the experiences that have received more attention in the literature.

[2] Some additional information on PSO programs can be found in ICAO (2005), Braathen (2011), Metrass-Mendes et al. (2013), RP Erickson & Associates (2015), and Wittman et al. (2016)

Also note that the imposition of public service obligations by a government must meet the rules defined in a general law that, in some cases, can be issued by a government of a higher territorial level. This is the case, for example, of the European Union where national governments must meet the guidelines defined in a European Law.

a. The European Union experience: High heterogeneity and discretional criteria

In the European Union (EU), the programs are set under a common legal framework defined by the European Commission.[3,4] However, the national governments within the EU have autonomy in the designation of protected regions, the determination of service levels and fares, and the magnitude of the subsidies.

The general aim of the legislation by the European Commission is to guarantee air services in poor regions or thin routes where air transportation provides vital economic links. Here, it is explicitly stated that surface transportation should not be a viable option, but the definition of a poor region or thin route is left to the interpretation of the national governments that effectively implement the program. Hence, other objectives may guide the policy, such as maintaining social cohesion and promoting tourism (Williams, 2010). Note that, in contrast to the U.S. policy under EAS, connections between small airports in EU countries are allowed.

Despite the autonomy in the designation of protected routes, national governments of the EU must follow the same procedures in awarding contracts. Specifically, governments issue an invitation to tender, which is published in the Official Journal of the European Union. The tender stipulates the service levels, which vary from country to country. Frequency floors and minimum number of seats are also always required. Other common requirements include earliest departure times and latest arrival times to guarantee daily round-trips. The maximum number of stops between airports and maximum wait times between flights can also be set, along with specific aircraft features (jets vs. turbo-props). In some cases, maximum total or average airfare values are imposed, as well as discount rates for residents or travelers with special needs.

If one or several airlines can meet the requirements set in the tender, then the government does not restrict market entry and flights are offered without the need of subsidies. Otherwise, the carriers bid for a subsidy to operate the route for a short period as a monopoly. Renegotiations of contracts are

[3] The legal framework is contained in Article 4 of Council Regulation (EEC) No. 2408/92 on "Access for Community Air Carriers to Intra-Community Air Routes."
[4] Norway also follows the same procedures as it is a former EU member.

possible if airlines demonstrate they cannot provide the service without losses under the existing conditions of a contract.

Routes operated under a PSO contract have been increasing in the last years. In 2015, the number of protected routes was about 240. Information on the amount of subsidies is difficult to obtain as some countries, for instance, Italy and France, do not report on subsidy values on some routes. Nevertheless, the total amount of subsidies spent by European countries is thought to be well above 200 million USD annually.

Several studies have analyzed PSOs implemented in European countries. Some have done cross-country analysis, such as Williams and Pagliari (2004), who criticize the high diversity in the PSO regimes applied in European countries. They stress that PSO designation seems to be arbitrary, benefiting remote regions in Scotland and Norway but also dense routes in islands in France, Italy, and Spain that receive a lot of tourists. In a similar vein, Williams (2010) provides data to show the high variation between countries in average subsidy per passenger and route maximum fares. To this point, Brathen and Halpern (2012) suggest that varied conditions, for instance, different competitive environments or different levels of asset specificity connected to the contract may justify the diversity.

Another group of studies that use cross-country data focus on the limited competition associated with PSOs contracts. In this regard, Merkert and Williams (2013) analyze the efficiency of 18 European airlines operating PSO routes in 2008-2009. The authors find that in the early months of the PSO contract, airlines perform better than when the contract approaches termination. This suggests that operators have few incentives to increase efficiency before the tender finishes due to the absence of competition. To this point, the few number of bidders (in many cases just one) and the short time allowed between notification that an airline has been selected in the tender and when it must start operations contributes to the lack of competition in the market (O'Fee, 2003).

Furthermore, Calzada and Fageda (2014) develop an econometric analysis of the determinants of competition using a sample of routes (protected and unprotected by PSOs) for five large European countries; France, Italy, Germany, Spain, and the United Kingdom. Their results suggest that, in comparison with similar unprotected routes, PSOs tend to reduce the intensity of competition at the route level.

Some studies have analyzed the PSO mechanism for a specific European country. For Spain, Calzada and Fageda (2012) estimate price and frequency equations for protected and unprotected routes in the

domestic market and find that prices are lower and frequencies are higher in routes regulated by PSOs contracts.[5]

For Norway, Lian and Ronnevik (2011) explain that residents in remote regions prefer to go by car to the larger airport and that this behavior undermines PSO services when a main airport is in the proximity. The reason for the airport leakage is that maximum fares regulated in the PSO contracts cover point-to-route flights, but not indirect flights, and air fares are much higher in routes departing from smaller airports. Hence, travelers prefer to spend more ground travel time to pay a lower air fare.[6]

Angelopoulos et al. (2012) find inconsistencies in the designation of PSO routes in Greece and also the average amount of subsidies per passenger[7], while Pagliari (2012) provides data that suggests that air fares would be higher and more unstable in routes connecting the Italian mainland and Sardinia if PSOs were eliminated.[8] Finally, Pita et al. (2013) propose an operational planning model to examine the

[5] In Spain, PSOs were first imposed for routes within the Canary and Balearic Islands in 1998. The objective was to compensate residents in these regions for the costs of their insularity. The requirements in terms of service levels and maximum fares were met on a subsidy basis although regional governments and lobbies linked to the tourist sector put pressure for a change on the price scheme. Hence, new contracts were set in 2006 with a more flexible price schedule. Moreover, for the thinnest routes of the Canary Islands, a new contract was set in 2012 in which a subsidy was granted in exchange of restricting entry. Currently under discussion is the establishment of a flat rate for residents in the islands, as local citizens, firms, and public authorities complain that fares are too high.

[6] In Norway, PSO contracts have been in effect since the EU introduced the program in 1997. This replaced a system of licenses, under which carriers accepted an obligation to serve one or more routes in return for a monopoly in the given sector(s). Under the former regime, cross subsidization of routes was achieved through the assignment of sets of "profitable" and "less profitable" routes to individual carriers. Note that in the current system, Widerøe airlines dominates most of the contracts so that implicit cross-subsidization may still be in place.

[7] In Greece, the first ten PSO air transport routes were tendered in 2001, and another tender for an extra nine routes was introduced the following year. The last tenders for 26 air transport PSO routes were announced in 2011, for which the duration of the contracts is four years (2012-2016). On all routes, the maximum PSO fare level, the minimum number of roundtrips, and the weekly number of offered seats are set by the authorities as a part of the tender requirements.

[8] Devoto et al. (2016) explain the evolution of PSOs in Sardinia. The first PSO with subsidized airfares was set in place in 2002, lasting two years, on routes from Sardinia's three regional airports to Rome and Milan. In 2004, a new PSO contract was set for one year without financial compensation for airlines but with maximum fares. A free market was effectively in place in 2006-2007 after some legal vicissitudes for the new contract. A high increase in air fares is documented for these years. In 2008–2009, a new PSO contract was introduced with no compensation to airlines but with more airlines operating the routes, more protected links to Sardinia's airports (including Bologna, Turin, Florence, Verona, Naples, and Palermo), and a further increase in fares. The following period was marked by appeals from the excluded airlines, extensions and delays in the preparation of the 2010–2011 tender, and the 2012 tender for which no bids were received. In November 2013, a new PSO was introduced with financial compensation for three years. Note also that the PSO contracts in Sardinia have usually incorporated a discount scheme for residents. Currently, there is a flat rate for Sardinian residents. Moreover, this flat rate is different depending on the period of the year: from September 16th to August 14th there is a flat rate for all passengers, resident or not. For the rest of the year, there is a discount for resident passengers only. <This represents just one month—please check the dates. If it is just one month, then the wording in the last sentence should be revised to reference the remaining month>.

design of subsidized air transportation, and apply this methodology to assess the Azores PSO system. They present a flight scheduling and fleet assignment optimization model that could be adopted by public authorities when designing air transport networks to minimize total social costs.

Overall, the main criticisms of the European system are the high heterogeneity in the policy across countries (and even within countries) and the discretional criteria for eligible routes, fares, service levels, and amount of subsidies. Furthermore, entry barriers in the tendering process are apparent due to the lack of transparency and the fact that there is just one month between notification of the tender and submission of bids. Finally, PSOs may be benefiting very dense routes (i.e., tourist islands). In terms of strengths of the European program, we can mention that some government protected routes are open to competition and do not require subsidies, which benefits communities with no surface transportation options ("lifeline" services).

b. USA: More clarity, although not specifically to "remote" areas

The U.S. uses a PSO scheme called the Essential Air Service (EAS) program to provide subsidies to airlines that serve 115 eligible communities (outside of Alaska) and 44 communities in Alaska. Anticipating that airlines would focus their operations on high-density routes, Congress established the EAS program as part of the Airline Deregulation Act of 1978.[9] Under the EAS program, if an airline cannot provide air service to eligible communities without incurring a loss, the federal government provides an airline a subsidy to serve those communities. The scale of the EAS scheme, in terms of the number of protected routes and resources spent, is similar to the entire EU program.

In contrast to the EU experience, the designation of protected routes is clearly specified. Protected communities must have had air services before the liberalization, be located more than 70 miles from a large airport, and meet some thresholds regarding a minimum amount of traffic and a maximum required subsidy for passengers. To this point, dense routes cannot be subsidized, and there is an emphasis on network connectivity. However, as a shortcoming, it can be said that eligibility is based on

[9] The EAS program was initially effective for 10 years, ending in 1988. However, in 1996, the U.S. Congress decided to make it permanent. Since then, Congress has amended the eligibility criteria several times to reduce costs of the program and mitigate the variation in the levels of subsidies per passenger across the protected routes. In this regard, the distance criterion to the closest hub has suffered several changes. Notably, in 2011, Congress set a per passenger cap of $1,000 regardless of the distance from a hub and imposed a minimum level of passengers to receive subsidies.

"to be thin" rather than "to be remote." In this regard, several protected routes are short enough to make viable the use of surface transportation modes.

Once it is demonstrated that the route cannot be operated on a commercial basis, airlines interested in receiving subsidies make proposals that include flight frequencies, the size of the connecting hub, aircraft equipment, schedules, and fares. In contrast to the EU scheme, subsidies are calculated through objective parameters, while the selection of the carrier includes several factors beyond the subsidy required. Finally, as in the EU scheme, contracts are for a short-term period.

The EAS scheme in the U.S. has also been examined in some studies.[10] Reports from the U.S. Government Accounting Office (2009, 2014) suggest two weaknesses of the EAS system: 1) the high variation in the amount of subsidies per passenger that is explained by the fact that payments are made on a per-flight basis and not on a per-passenger basis; and 2) subsidized routes are underutilized so that load factors are low in EAS routes in comparison to unprotected routes. However, it is also recognized that only airports in eligible communities that received EAS-subsidized service have experienced an increased number of flights since 2007.

Metrass-Mendes and de Neufville (2010) show some efficiency gains from EAS, mostly attributable to the policy of encouraging competition between air carriers seeking to provide service to eligible communities. However, they also state that the EAS system is not considering the changing conditions in the aviation market, the speed of surface transportation, and the distribution of the population within the country since deregulation in 1978. The latter is also suggested by Grubesic and Matisziw (2011) and Özcan (2014a).

Grubesic and Matisziw (2011) reveal the presence of a high level of redundant coverage within the EAS network. Furthermore, they claim that many air links are short enough to be covered by ground transportation. Nevertheless, Özcan (2014b) demonstrates that EAS communities that could sustain their subsidized flights experienced had higher per capita income growth in the 1999-2011 period than did ex-EAS communities that lost their flights because of non-eligibility. Finally, a few studies made comparative analysis of the European and U.S. experiences with PSOs policies. Santana (2009) examines the impact of PSOs on the productive efficiency of European and U.S. airlines for the period 1991-2002

[10] These studies generally do not consider communities in Alaska, which are subject to much more flexible requirements that are not representative of the rest of the country.

and finds that PSOs increased the operation costs of European carriers; author does not observe a similar effect in the U.S. system.

Wittman et al. (2016) classify routes per their goals and network structures in a comparative analysis that includes the U.S. and the EU. They identify PSO schemes aimed to provide network access. Such schemes emphasize onward connections for residents in remote or small communities, connecting inhabitants to a larger range of cities. This would be the case of the U.S. model. Furthermore, they consider PSO schemes focused on guaranteeing lifeline services, which means that PSOs provide point-to-point links that connect remote regions with a nearby urban center. This would be the case, for example, of Norway or Sweden. In other cases, as in France, Portugal, or Scotland, both network access and lifeline services exist, as PSOs connect remote territories, such as islands, to each other and to mainland hubs.

c. Other specific/s route/s-based policies worldwide: Australia, Malaysia, Peru, and Chile

The Australian Federal Government implemented a PSO scheme in 1983 called the Remote Air Service Subsidy (RASS). The objective of this program is to ensure communities in remote and thin route areas have access to air services for the transportation of passengers and essential goods by subsidizing a regular weekly flight. Communities willing to receive RASS services must meet two requirements: a demonstrated need for a weekly air service, and being sufficiently remote in terms of surface travel time. The RASS Scheme provides direct support to air services in 257 communities, including 86 indigenous communities. An important fact to consider with this program is that the population range of the protected communities is from 6 to 200 people. The total budget of the program is about 14 million USD.[11]

Australia is divided into 10 geographical regions under the RASS Scheme. Airlines are contracted for a short-term period with the Australian Government through a competitive tendering that must meet the Commonwealth Procurement Rules to provide air services in each area (each area has a single operator). The Scheme operates on a fixed annual budget. The capacity to admit communities is limited by the budget available for RASS activities in any given year, and all prior financial commitments are considered.

[11] In addition, the state governments of Queensland and South Australia both subsidize regional airlines serving specific remote routes. Note also that in four states, incumbent airlines are protected from competition in intra-state flights, which may have consequences for the services in remote and/or thin communities.

The RAAS scheme does not attract the same level of criticism as do the U.S. and EU programs (RP Eriksson and Associates, 2015). This may be explained by the smaller scale of the program and the well-defined criteria for designating protected communities and subsidies. In this regard, Merkert and Hensher (2013) analyze differences between the PSO schemes in Europe and Australia. They conclude that the Australian model is simpler and clearer, and contracts tend to be more complete. Indeed, some of the strengths of the Australian program include the objective determination of the subsidy, the transparency of the tendering procedure, and that it benefits very remote and small communities.

In Malaysia, a specific type of PSO program is also in place called the Rural Air Services (RAS) Scheme. In contrast to the other programs examined, the RAS scheme is based on a long-term contract between the government and MASwings, which is a subsidiary of Malaysia airlines, a state-owned firm. Hence, the contracts are not awarded through a tender in a competitive procedure, which is a clear shortcoming of the program. With their contract, MASwings provides services within the regions of Sabah and Sarawak in Borneo. MASwings operates 49 RAS routes with small aircrafts. Note that entry is open to other airlines and fares and service levels are not regulated.

The full cost for the operation of RAS routes by MASwings is fully paid by the Malaysian Government in the form of subsidies and aircraft rental payment. Hence, there are no clear incentives to keep the subsidies at a minimum. The annual budget of the program is about 3 million USD. Furthermore, MASwings does not have to pay the goods and services tax in protected routes.

The two explicit objectives of the Malaysia program are to promote national integration by enhancing connectivity between the mainland and Borneo and to support travel for rural communities where air transport has become the main mode of connection to the outside world. One of the advantages of the program is that it emphasizes network connectivity, as the protected routes address the links between the regional capitals and smaller airports. However, a clear shortcoming is that some of the protected routes are dense routes. In fact, dense routes are also served by private airlines, which undermine the rationale of the subsidies. Currently, a new contract between the government and MASwings is being negotiated that includes fewer resources and less routes protected.

In Peru, there is a PSO scheme (Programa de Integración Amazónica por vía Aérea) that subsidizes routes within the Amazonas that link the four main airports with smaller airports. Hence, network connectivity is emphasized and the program benefits very remote and small communities. Currently, there are 14 protected routes and the annual budget is about 2 million USD. Contracts are for 1 year

(renewable for another year), but there is a lack of transparency regarding the carrier selection criteria and the determination of the amount of subsidies. Flight frequencies and the type of aircraft are regulated, and flat rates are also set.

Finally, in Chile subsidies have been awarded through a competitive tender to provide air services in the region of Magallanes y Antártica Chilena. Currently, only two routes that link the regional capital with smaller airports benefit from these subsidies. The contract is for three years, and it specifies the flight frequency, the type of aircraft to be used, and the flat rates.

d. Traffic distribution rules: The case of India

Another policy option is the implementation of traffic distribution rules that imply a cross-subsidization between dense and thin routes. India is the most relevant example of the implementation of this policy, defined in a specific law.

The policy used in India to support air services in remote regions is what it is called the Route Dispersal Guidelines (RDGs), which forces airlines to distribute traffic across three categories of airports. Under this program, which was set in 1994, routes are classified in three categories: Category I, II and III. Category I includes routes from Bombay, Calcutta, and Delhi to other large cities. Category II includes airports in the North-East region, Jammu and Kashmir, Andaman and Nicobar Islands, and Lakshadweep. Category III includes airports and routes other than those in I and II.

The RDG program states that any airline that operates scheduled air transport service on one or more of the routes under Category I shall be required to provide service in Categories II & III as follows:

- Deploy at least 10% of the capacity deployed on routes in Category I on routes in Category II.
- Of the capacity required to be deployed on Category II routes, deploy at least 10% on services operated exclusively within Category II.
- Deploy at least 50% of the capacity deployed on routes in Category I on routes in Category III.
- Within Category II: Deploy at least 6% of total domestic capacity to airports in remote regions. Remote regions are defined as all airports in the North-East except Guwahati and Bagdogra, all airports in Jammu and Kashmir except Jammu, all airports in Andaman and Nicobar Islands and Lakshadweep. It is mandatory for airlines to operate at least 1% of their total capacity on routes operated within these remote regions.

Airlines offering services in remote areas also enjoy other benefits like tax exemptions (airport charges, fuel, local taxes), an allowance of self-ground handling, and risk sharing through underwriting

of seats. The latter implies that a certain number of seats for a specified operator are blocked by the government at a pre-specified air fare. The operator must first make efforts to sell all the seats on its aircraft. Such selling of seats is done by the operator at market rates. In cases where the operator is not able to sell all of the seats, the government makes payment for the blocked number of seats at pre-decided fares. Finally, some states also arrange subsidies with specific airlines.

The two explicit objectives of the RDG are to ensure that all regions in India have access to air services and to ensure that airlines fulfill some social obligations. Note, however, that the program benefits regions like Kashmir and some parts of the North-East that are in dispute with neighboring countries so that national integration may also be considered an objective of the program. Currently, more than 40 routes that serve remote regions are affected by this policy.

Several reports by the Indian Government (2014, 2016) have analyzed the main shortcomings of the RDG program with the aim of promoting the implementation of a PSO scheme that is currently under discussion. The RDG program implies a cross-subsidization between categories of routes such that airlines incur losses when operating in airports of category II and must set higher fares in routes from category I. Furthermore, the program requires that airlines with a fleet based on big aircrafts must operate in category II routes, creating entry barriers for specialized operators (regional carriers) that could provide flights with smaller and more efficient aircrafts. Finally, airlines follow a cream skimming strategy when operating in categories II and III airports as only state capitals are well served.

3. Passenger-based policies: discounts to residents

The use of discounts to residents in remote regions (that may be embedded in PSO contracts or not) is another policy that can be used by countries.[12] Spain is the country spending the most resources with this policy. Other examples include Ecuador, Portugal, and Scotland. Discounts to residents can be embedded in the public services obligations or they may be granted through a specific law.

In Spain, all residents of the Canary and Balearic Islands (and Ceuta & Melilla) enjoy a 50% price discount in domestic flights, which is financed from public funds (central government).[13] Island residents

[12] In Europe, these subsidies are an exemption within the general European legislation on state aid rules.

[13] In Spain, the first application of legislation in this regard was in 1960. The discounts over market fares have increased in successive reforms due to pressures of local interests in the islands. In this regard, the percentage that represent the discounts increased from 10% (in application from January 1988 to August 1998), to 33% (in application from August 1998 to February 2005), to 38% (in application from February to December 2005), to 45% (2006) and finally to 50% (in application from January 2007 onward).

also benefit from lower airport charges. The amount of resources spent in this program is about 300 million euros per year. In fact, this quantity is higher than the whole PSO program in Europe or the U.S.

In Scotland, the regional government has introduced a social discount scheme that gives residents living in the Highlands and islands a 50% discount on prices. These discounts benefit residents of remote communities in areas including Colonsay, Orkney, Shetland, the Western Isles, Islay, Jura, Caithness, and North West Sutherland.

There is a remarkable difference between the discount policies in these two European countries. In Scotland, travelers in PSO routes do not enjoy inter-island discounts, while in Spain, inter-island routes have PSO contracts and residents reap the benefits of these discounts.

In Portugal, flat fares are set for residents and students in Azores on domestic flights to Madeira or the mainland. Hence, they enjoy subsidies amounting to the difference between the market price and the flat rate. Note that in Portugal, discounts have been removed from PSO contracts since 2015. In other countries, including France or Italy, residents in islands may enjoy some benefits (i.e., discounts, lower maximum fares, flat rates), but these benefits are embedded in PSO contracts.

Another example of the use of discounts for residents can be found in Ecuador. Residents in Galapagos enjoy a flat rate for domestic destinations, and 15 seats on each flight are blocked for residents. There is an additional 50% discount for children, the elderly, and residents with special needs. Finally, subsidies are granted for travelers with concrete travel needs (medical care, shopping, etc.) in some countries. Canada is a good example of this policy.

Note that an important difference in the discount policy is in the mechanism applied. In some countries, residents enjoy of a discount that is computed as a percentage over market fares. This is the case of Scotland and Spain. In other countries, residents enjoy flat rates or specific maximum fares. This is the case of Ecuador, France, Italy, and Portugal. To this point, Valido et al. (2014) suggests that the effects of the different mechanisms are related to the proportion of residents/non-residents and their willingness to pay.

A clear shortcoming of a discount policy is that non-residents that travel to these locations must pay the full price of the service, and prices without the discount may be higher. In this regard, the effects of discounts to residents in Spain have been examined in three studies. Calzada and Calzada (2012) estimate demand and pricing equations with a sample of protected and unprotected routes of the

domestic market. They find that routes that benefit from price discounts enjoy higher demand but prices (without the discount) are also higher. The logic behind these findings is that the discounts cause the demand of island residents to be less elastic, while the supply may not respond easily to the increased demand. Hence, part of the benefits of the discounts is transferred to the airlines via price increases. In a similar vein, Fageda et al. (2012) examine price differences between domestic and international routes departing from the airport of Gran Canaria. Controlling for different attributes of the routes, they find that prices are higher in domestic routes, which can be explained by the fact that residents in the island only enjoy discounts in domestic routes. Finally, Fageda et al. (2016) examine data for a period with a change in the proportion of the discount to island residents from 33 to-50%. Interestingly, the authors do not find substantial differences in the fares set by airlines with a change in the amount of the discount.

4. Airline-based policies: State-owned firms, a likely weak control on financial assistance provided

Social services provided by state-owned airlines constitutes another policy to support air services in remote regions. This is the case for countries including Colombia, Ecuador, and Malaysia. Privatization and deregulation of airlines has been some processes implemented in many countries around the globe. However, we still find several countries that guarantee air services in unprofitable routes through a state-owned airline. For our purposes, our interest here is in those countries that have remote regions. Examples of countries with state-owned airlines and remote regions include: Algeria (Air Algerie), Argentina (Aerolineas Argentinas), Egypt (EgyptAir), Ethiopia (Ethiopian Airlines), Indonesia (Garuda Indonesia), Pakistan (PIA), and Russia (Aeroflot). However, these airlines provide air services throughout the whole territory and their route network may include a high number of international destinations. Hence, it is difficult to disentangle how these countries meet the needs of remote regions as there are no specific programs in place.

To this point, state-owned regional airlines that only operate in small airports of the national system may be understood as a more specific policy to address the needs of remote regions. Examples of state-owned regional airlines can be found in Bolivia (BoA Regional), Colombia (Satena), Ecuador (Tame Amazonia), and Malaysia (MASwings).

In Bolivia, the state-owned airline was created in 2016 as a regional subsidiary with the aim to provide air services in mid-size cities of the country, which may not be necessarily located in remote

regions. In the case of Colombia, Satena offers social service route offerings that are unprofitable but also commercial services in profitable routes, where it competes with other airlines. Hence, Satena covers the social service routes through cross-subsidies from commercial to social services. It also receives subsidies from the government to fund losses. A major shortcoming of this model is the discretional choice of social destinations so that some remote regions may be not served. Furthermore, another disadvantage of the model is the complex definition of subsidies required from government.

In Ecuador and Malaysia, the flag carriers have subsidiaries that operate exclusively in remote regions that rely on government subsidies for their operations. TAME Amazonía operates flights within the Amazonas by means of connecting the regional capital with smaller airports. Service levels are specified and passengers can fly at a flat rate. In the same vein, MASwings operate flights within the Malaysian regions of Borneo, having the regional capitals as operating bases.

An important difference between the countries under discussion is that in Ecuador air services are offered for very remote and thin communities. This is not necessarily the case of Bolivia, Colombia, and Malaysia, where dense routes and/or routes with big endpoints may also be served by their state-owned regional airline.

Canada represents a special case within the state-owned regional airlines model. In this regard, several Inuit and First Nations organizations hold a significant position in support of air accessibility for small remote communities in Northern Canada. The most visible mechanism of air service support by these organizations is the establishment of fully-owned or joint-venture carriers (Metrass-Mendes et al., 2011).

To this point, it is also worth mentioning that state-owned firms may be created explicitly to support air services in remote regions as is the case of Canada, Ecuador, and Malaysia. In other countries, as is the case of Colombia and Bolivia, the state-owned firm is not aimed explicitly to support air services in remote regions, although in practice, some of their routes cover flights to remote regions.

The main problems with this model is that there are no incentives to promote efficiency. Competition is distorted and governments usually have weak control over the direction of any financial assistance provided (ICAO, 2005). Furthermore, most of the key decisions for the adequacy of the service (flight frequency, fares, subsidies) are discretional.

5. **Airport-based policies: carrier incentives schemes (airport fees' discounts) and subsidies to airports**

Regarding airport programs, we can differentiate between incentives to airlines to launch new routes that are channeled through airports and subsidies for expanding or improving the capacity of the infrastructure. Note here that in general these programs are not specifically addressed to remote regions and usually both small and large airports may take benefit from them. Airport programs, as well as state-owned firms, are policies that are usually not derived from a specific law although they may be subject to a general legal framework.

a. Carrier incentive schemes (airport fees' discounts)

In Europe, it is common to use incentive schemes by regional authorities and/or the airport operator to attract airline operations (Malina et al., 2012; Allroggen et al., 2013; Wittman, 2014). These incentives may take the form of discounts on airport fees, bonus payments to airlines for a limited period in exchange for new routes, guaranteed growth in passengers transported, and joint marketing activities. While these initiatives are usually made in small airports, they may also take place in large ones.

Small airports in Europe are usually state-owned so that these payments to airlines may be investigated by the European Union as they may be against competition laws regarding state air rules. In this regard, the EU guidelines for state aid to airlines specify that public airports with less than 3 million passengers per year (or airports in remote regions regardless of size) may offer transparent and non-discriminating incentives to airlines for additional traffic. Financial support to airlines must not exceed extra start-up costs, is limited to 3 years, and competitive tendering is required. In practice, incentive schemes do not necessarily meet EU guidelines. In practice, funds may be allocated through bilateral agreements (or non-transparent tendering), and subsidies may be much higher than start-up costs. Furthermore, the agreement/contract may be for more than 3 years.

In any case, it is important to mention that there is no explicit program either in the EU or at the national level so that these incentives are usually not disclosed officially. Hence, it is difficult to obtain information about the amount of resources devoted to carrier incentive schemes, although it is thought to be quite high. For instance, a report from the competition authority in Spain shows that regional governments in Spain spent 250 million euros to finance airline operations located in their territory during the period 2007-2011.One example of an official carrier incentive program is the Route Development Fund (RDF) that was implemented by the United Kingdom from 2003 to 2007. The goal of the fund was to stimulate the establishment of new direct links by facilitating the sharing of risk

between airports and airlines through public funding from regional bodies. Funds were allocated to routes that could likely become commercially viable after the first three years. The subsidies were channeled through airports by applying discounts on airport charges, funding marketing expenses, and making payments based on rates per passenger. Eighty-one routes received funding, and it was mainly used by Scotland, Northern Ireland, and Wales for international routes. It was cancelled in 2007 due to the more restrictive criteria of the European Union regarding state aid rules. Smyth et al. (2012) provide evidence favorable to this fund. Results of their analysis suggest that the fund significantly increased traffic in the airports where it was implemented.

In contrast to the EU, the U.S. has an explicit and official program targeted to small airports, which is known as The Small Community Air Service Development Grant Program. The annual public budget devoted to this program is about 10 million USD and no more than 40 airports benefit from it. Hence, it is a more modest program than the EAS program, and it certainly uses fewer resources than governments in Europe.

The U.S. federal government provides funds to airports under this grant program to execute specific incentive packages to market existing air services or gain additional service. Criteria for communities to be eligible are more flexible than in the EAS program. Any small-hub or non-hub airport may be eligible and grants can be applied even with unsubsidized commercial air service.

These U.S. grants may be applied to fund revenue guarantees, airport charges discounts, marketing initiatives, studies of air service feasibility, new airport equipment, new airport infrastructure, and other incentives. Grant proposals by airports are evaluated based on the following characteristics: higher-than-average airfares, limited existing service, expected economic impact, and support from the communities and airlines. Wittman (2014) analyzes data that suggests that grantees in many cases (approximately 60-70%) have been unsuccessful in achieving their proposed goals. He recommends more restrictive criteria for eligibility as non-hub airports are more successful than small-hub airports.

b. Subsidies to airports

With respect to government subsidies to airports, it must be remarked that many small (even medium) airports and/or airports located in remote regions are owned by public entities around the world. Hence, subsidies may come from cross-subsidization from large to small airports when management of the airport's national system is centralized. Alternatively, they may come directly from the budget of regional/local governments when they are managed individually.

An example of state-ownership of airports located in remote regions is that of Canada. Here, airports are considered to be remote if air transportation is the only reliable year-round mode of transportation available to the community it serves. The Canadian federal government is responsible for the operation or funding of 13 remote airports across that country. Several regional governments also have explicit programs to support funding of remote airports. Furthermore, there is a specific program (Airports Capital Assistance Program) that subsidizes projects aimed at improving safety, protecting assets, and reducing operating costs at small airports. In this regard, eligible airports are those not owned by the federal government (the 26 largest airports are excluded). Seven hundred and nine million USD have been spent through this program for 835 projects at 176 airports since 1995 (Transport Canada: https://www.tc.gc.ca).

In the U.S., the airport improvement program provides grants for projects that promote improvements related to safety, capacity, and the environment. However, it is not explicitly designed for remote or small communities. Funds to finance this program come from airport charges and fuel taxes. The federal government co-funds the costs of this project. It may co-fund 70% of the costs for large airports, and 90-95% of the costs for small airports. The federal government spends about 3 billion USD per year on this program.

In Australia, the Remote Airstrip Upgrade Funding Component provides grants specifically for projects with airports in remote regions that improve weather capability, safety, and nighttime operations. In this regard, the eligible airports/aerodromes must be in remote or very remote regions according to the Accessibility/Remoteness Index of Australia (ARIA). Furthermore, they have to be beneficiaries of the RASS subsidies. Finally, priority is given to indigenous communities.

The Australian federal government co-funds projects. Co-funding may range from 33-50% of the total costs of a project. Criteria for selecting project proposals for funding include the need for enhanced safety, economic impact on the community, and maintenance capabilities. The annual budget for this program is about 6 million USD.

In Brazil, the federal government provides co-funding for projects for the improvement or expansion of capacity at small and/or unprofitable airports (managed by states/municipalities) through a specific program (Programa Federal de Auxílio a Aeroportos). Funds come from taxes paid by concessionaires of private airports and the general budget. This program is based on agreements between the federal and state governments. States make the proposals and the federal government makes the decision, while

the tender and supervision oversight rests with the states/municipalities. States must fund 20% of the costs. Currently, the federal government has contracts with 8 states, and the amount of resources spent annually is about 32 million USD.

6. Discussion and concluding remarks

In this paper, we have reviewed the main policies used to guarantee air connectivity in remote regions. Table 3 summarizes the benefits and potential risks of the different policies described in this review.

Table 3. Benefits and potential risks of different policies to support air services in remote regions

Policy	Benefits	Potential Risks
Route-based policies	• Transparent and structured process • Beneficiaries are well defined • Limits on the amount of expenditure committed • Competition for the contract is possible	• Incomplete contracts • May be used for different goals • May be an arbitrary choice of: eligible routes/communities, carriers, subsidies, fares, and service levels • May prevent competition in the market
Route-based policies: Traffic distribution rules	• No need of direct subsidies • Private airlines meet social goals	• Complex process of monitoring and auditing • Distortion to competition (implicit cross-subsidies, prevent airline specialization • Hard to guarantee air services in the most remote regions
Passenger-based policies: Discount to residents	• Direct benefit to users • May benefit travelers with special needs (medical, students, etc.)	• Harms non-residents • Do not discriminate between residents according to their willingness to pay
Airline-based policies State-owned firms	• Weak risk of effective bankruptcy	• Hard to maintain sustainability due to complex cross-subsidies scheme • Hard to separate the benefits to remote regions • May affect the regular market with subsidized tariffs

		• Weak incentives for efficiency
Airport-based policies: airport programs	• Engagement of local authorities • May provide needed facilities for airline services	• Hard to guarantee sustainability in the long term, subject to political decisions • May benefit airports not in remote regions • Expenditures may be high

Source: authors.

Overall, many of these policies have received criticism. In this regard, it can be stated that in some cases the real need of the policy to protect routes is doubtful, as they may be well served by surface transportation. In other cases, as is the case of tourist islands in Europe, commercial flights may be viable on a subsidy-free basis. Another criticism is the high heterogeneity in these policies in places where the scale of the programs applied is high. This is especially the case in the European Union and the U.S. Furthermore, it is typical for the designation of eligible routes to be arbitrary, and similarly arbitrary with respect to determination of service levels, fares, and subsidies. A further criticism relates to the lack of proper incentives to provide air services efficiently and the possible distortion of competition, especially in those routes where commercial flights could operate without incentives. Load factors in some routes may also be very low. Finally, the consistency between the objectives and the results of the policies is not always clear, particularly in the case of the European Union.

However, what is well documented in the literature is the strong link between air services and economic growth. This is particularly true in those regions where surface or maritime transportation is not adequate to guarantee their connectivity. Thus, once the need of air services has been demonstrated, the discussion should be on the appropriate execution of these policies, rather than on justification.

Clearly, air transportation provides an essential service in remote regions. The reviewed policies have a high diversity in their implementation, and many have received considerable criticism. While there is room for improvement in implementation, these policies nevertheless contribute to the well-being of citizens living in remote regions, although the precise benefits remain mostly unmeasured.

Some remaining issues are whether the policies reach communities with a real need of government intervention; whether there is consistency between the objectives and the results of policies; whether the policies appropriately address service levels and fares in protected routes; whether they effectively measure the level of heterogeneity in the market and the scope of competition; and finally, whether the

policies efficiently use public resources. These questions constitute an avenue for further research with the aim of shedding additional light on the adequacy of different policy instruments.

References

Allroggen, F., Malina, R., Lenz, A.K. (2013). "Which Factors Impact on the Presence of Incentives for Route and Traffic Development? Econometric Wvidence from European Airports," *Transportation Research Part E: Logistics and Transportation Review*, 60, 49-61.

Angelopoulos, J., Chlomoudis, C., Christofas, P., Papadimitriou, S. (2013). "Cost Assessment of Sea and Air Transport PSO Services: The Case of Greece, *International Journal of Maritime," Trade & Economic Issues*, I (2), 3-40

Arvis, J.F., Shepard, B. (2011). *The Air Connectivity Index: Measuring Integration in the Global Transport Network*, World Bank Policy Research Working Paper, 5722.

Braathen, S. (2011). *Air Transport Services in Remote Regions*, International Air Transport Forum, Discussion Paper 13, 1-23.

Bråthen, S., Halpern, N. (2012). "Air Transport Service Provision and Management Strategies to Improve the Economic Benefits for Remote Regions," *Research in Transportation Business & Management*, 4, 3–12.

Calzada, J., Fageda, X. (2012). "Public Services Obligations in the Airline Market: Lessons from Spain," *Review of Industrial Organization*, 40 (4), 291-312.

Calzada, J., Fageda, X. (2014). "Competition and Public Service Obligations in European Aviation Markets," *Transportation Research-A*, 70, 104-116.

Devoto, R., Meloni, I., Rassu, N., Sanjust di Teulada, B. (2016). "Air Travel Demand Forecasting in the Presence of Public Service Obligation (PSO), " *Journal of Airport Management*, 11 (1), 90-103.

Di Francesco, A., Pagliari, R. (2012). "The Potential Impact of Removing Public Service Obligation Regulations on Air Fares Between the Italian Mainland and the Island of Sardinia," *Journal of Transport Geography*, 24, 332–339.

Fageda, X., Jiménez, J.L., Díaz, C. (2012). "Fare Differences Between Domestic and International Air Markets on Routes from Gran Canaria," *Journal of Air Transport Management*, 25, 8-10.

Fageda, X., Jiménez, J.L., Valido, J. (2016). "Does an Increase in Subsidies Lead to Changes in Air Fares? Empirical Evidence from Spain," *Transportation Research-A*, 94, 235-242. Government of India, Ministry of Civil Aviation (2014). *Policy on Regional and Remote Are Air Connectivity*.

Government of India, Ministry of Civil Aviation (2016). *Draft Regional Connectivity Scheme (RCS or the Scheme*).

Grubesic, T.H., Matisziw, T.C. (2011). "A Spatial Analysis of Air Transport Access and the Essential Air Service Program in the US," *Journal of Transport Geography*, 19, 93-105.

ICAO (2005). *A Study of an Essential Service and Tourism Development Route Scheme*.

Lian, J.I., Rønnevik, J. (2011). "Airport competition – Regional airports losing ground to main airports," *Journal of Transport Geography*, 19, 85–92.

Malina, R., Albers, S., Kroll, N. (2012). "Airport Incentive Programs: A European Perspective," *Transport Reviews*, 32(4), 435-453.

Matisziw, T.C., Grubesic, T.H., (2010). "Evaluating Locational Accessibility to the US Air Transportation System," *Transportation Research Part A*, 44, 710-722.

Matisziw, T.C., Lee, C.L., Grubesic, T.H. (2012). "An Analysis of Essential Air Service Structure and Performance," *Journal of Air Transport Management*, 18, 5-11.

Merkert R., Hensher, D.A. (2013). "The Importance of Completeness and Clarity in Air Transport Contracts in Remote Regions in Europe and Australia," *Transportation Journal*, 52 (3), 365-90.

Merkert, R., O'Fee, B. (2013). "Efficient Procurement of Public Air Services - Lessons Learned From European Transport Authorities' Perspectives," *Transport Policy*, 29, 118-25.

Metrass-Mendes, A., de Neufville, R. (2010). *Air Transport Policy for Small Communities: Lessons from the U.S. Experience*. Proceedings from the 14th ATRS Conference, Oporto, Portugal.

Metrass-Mendes, A., de Neufville, R., and Costa, A. (2011). *Air Accessibility in Northern Canada: Prospects and Lessons for Remoter Communities*. ERSA conference proceedings, European Regional Science Association.

Metrass-Mendes, A., de Neufville, R., Costa, A., Oliveira, A.V.M. (2013). *Comparing Air Transport Policies for Small Remote Communities: U.S.A., Canada, Portugal, Spain and Brazil*, Càtedra Pasqual Maragall d'Economia i Territori, Working Paper 02/2013.

O'Fee, B. (2003), *Tendering for a PSO Route: The Experience of a New Entrant Airline*. Third Forum on Air Transport in Remoter Regions (Cork).

Özcan, I.C. (2014a). "A Community Evaluation of Essential Air Services," *Journal of Air Transport Management*, 36, 110-119.

Özcan, I.C. (2014b). "Economic Contribution of Essential Air Service Flights on Small and Remote Communities," *Journal of Air Transport Management*, 34, 24-29.

Pita, J.P., Antunes, A.P., Barnhart, C., de Menezes, A.G. (2013). "Setting Public Service Obligations in Low-demand Air Transportation Networks: Application to the Azores," *Transportation Research Part A*, 54, 35–48.

RP Erickson & Associates (2015). *Comparison of Approaches for Supporting, Protecting & Encouraging Remote Air Services*. Prepared for: CTA Review Secretariat Transport Canada.

Santana, I. (2009). "Do Public Service Obligations Hamper the Cost Competitiveness of Regional Airlines?" *Journal of Air Transport Management*, 15, 344–349.

Smyth, A., G. Christodoulou, N. Dennis, M. AL-Azzawi, J. Campbell (2012), "Is Air Transport a Necessity for Social Inclusion and Economic Development?" *Journal of Air Transport Management*, 22, 53-59.

US Government Accountability Office (2009). *Options and Analytical Tools to Strengthen DOT's Approach to Supporting Communities' Access to the System Programs and Options for Providing Air Service to Small Communities*.

US Government Accountability Office (2014). *Status of Air Service to Small Communities and the Federal Programs Involved*.

Valido, J., Socorro, M.P., Hernández, A., Betancor, O. (2014). "Air Transport Subsidies for Resident Passengers When Carriers have Market Power," *Transportation Research Part E*, 70, 388-399.

Williams, G. (2010). "European Experience with Direct Subsidization of Air Services," *Public Money and Management*, 25, 155–161.

Williams, G., Pagliari, R. (2004). "A Comparative Analysis of the Application and Use of public service Obligations in Air Transport within the EU," *Transport Policy*, 11, 55–66.

Wittman, M.D., Allroggen, F., Malina, R. (2016). "Public Service Obligations for Air Transport in the United States and Europe: Connectivity Effects and Value for Money," *Transportation Research-A*, 94, 112-126.

Wittman, M.D. (2014). "Public Funding of Airport Incentives in the United States: The Efficacy of the Small Community Air Service Development Grant program," *Transport Policy*, 35, 220-228.

Table A1. Public service obligations: objectives and communities protected

Country	Objectives	Eligibility criteria (communities)
Australia	To guarantee the carriage of passengers and essential goods in remote and isolated areas where a regular air service offers the only reliable means of transport.	1. Having a demonstrated need for a weekly service (the location must demonstrate that the cost of subsidy-free flights is higher than an equivalent service under a subsidy). 2. Being sufficiently remote in terms of surface travel (beyond two hours to a population center providing essential goods and services; or beyond one hour to a location receiving a weekly subsidy or equivalent air service).
Chile	To provide regular air services at a low price in communities with inconvenient access by surface transportation.	Region of Magallanes and Antártica Chilena (links from the regional capital to smaller communities)
European Union + Norway	A Member State may impose a public service obligation in routes serving a peripheral or development region or on a thin route that is considered vital for the economic and social development of the region. That obligation shall be imposed only to the extent necessary to ensure, on that route, that the minimum provision of scheduled air services satisfy fixed standards of continuity, regularity, pricing, or minimum capacity that air carriers would not assume if they were solely considering their commercial interest. If alternative modes of transport (i.e., rail) can be used on the same origin-destination pair with a travel time of less than three hours, then the necessity and the adequacy of the PSO service shall be assessed.	Discretional
Malaysia	1. To promote national integration by enhancing connectivity between the Peninsula and Borneo; 2. To support rural travel for rural communities where air transport has become the main mode of connection to the outside world.	Routes within Sabah and Sarawak (Borneo)
Peru	To provide regular air services at a low price in small and isolated communities in the Amazonas.	Routes within the Amazonas
United States	To guarantee that small communities that were served by air carriers before deregulation maintain a minimal level of scheduled air service and retain a link to the national system.	1. Air services before liberalization; 2. Distance more than 70 miles from a hub (large or medium); 3. At least 10 passengers per day; 4. Requiring a subsidy per passenger < $1000 (< $200 if distance > 210 miles); 4. Other communities can be eligible if regional/local governments share 50% of costs; 5. Communities in Alaska must meet more flexible requirements.

Source: authors.

Table A2. Public service obligations: contracts and subsidies

Country	Contracts	Eligibility criteria (carriers)	Mechanism for calculate subsidy	Amount of resources (million USD)[1]	Regulated parameters
Australia	Tendering has to meet general rules (Commonwealth Procurement Rules). Contracts are for 2-3 years.	Safety qualification, financial viability, operation ability, and amount of subsidy.	Government and interested firms estimate costs. A fixed annual budget is allocated for the program (funds for additional communities are limited by the budget available and prior financial commitments).	14 (2015)	Entry, frequencies, type of aircraft
Chile	Subsidies within a general legal framework. Contracts are for 3 years.	Amount of subsidy, age of the aircraft, experience of the pilot, capacity.	Subsidies for 50 seats (40% discount in relation to market prices).	0.7 (2016)	Entry, frequencies, type of aircraft, fares
European Union + Norway	The government issues an invitation to tender that is published in the Official Journal of the European Union. The tender stipulates service levels and maximum fares. There are two tender rounds – the initial tender asks for carriers willing to offer a subsidy-free operation; a second tender invites carriers to bid based on receiving a subsidy. Contracts are for 2-5 years.	Adequacy of the service and subsidies (if required).	Subsidies to meet service and fare requirements (if required).	>200 (2010-2011)	Entry (some), frequencies, type of aircraft, scheduling (some), fares (some)
Malaysia	Bilateral contract between the central government and a state-owned firm. Contracts are for 10 years.	No competitive procedure	Full cost of operating the services are paid by the central government.	3 (2015)	Not regulated
Peru	Tendering process with no transparent criteria. Contracts are for 1 year.	N.A.	Subsidies to meet service and fare requirements.	2 (2016)	Entry, frequencies, type of aircraft, fares
United States	Tendering for subsidies when it is demonstrated that any airline can offer flights without subsidy. Airlines receiving a subsidy are obligated to provide service throughout the entire duration of the subsidy and may not exit the market unless a replacement carrier is found. Contracts are for 2-4 years.	Reliability and experience to provide air services, agreements with the network carriers in the hub, community preferences, subsidy amount.	Estimation of costs based on information about the aviation industry's pricing structure, the size of aircraft required, the amount of service required, and the number of projected passengers. An annual subsidy is set to compensate the airline for the amount by which projected operating costs exceed expected passenger revenues as well as a profit element of at least 5% of total operating expenses.	250 (2015)	Frequencies, size of the connecting hub, aircraft equipment, schedule and fares

Note 1: In parentheses dates indicate which year(s) data is available. European countries with information on the amount of subsidies available include: Greece (33), Norway (82), Portugal (68), Spain (5), Sweden (9), United Kingdom (6).

Source: authors.