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Free Sky and Clouds of Restrictions[☆]

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Abstract

An increasing percentage of trade occurs via air. However, air services are excluded from the WTO Agreement and, as a result, the aviation market is regulated by a plethora of Air Services Agreements. In this paper, we investigate the extent of discrimination -in terms of access to international air services- generated by this system. In particular, using recently available information on Air Services Agreements for 184 countries, we estimate the impact of international air services liberalization on air passenger flows. We find that increasing the degree of liberalization has a positive and significant effect. For instance, the higher degree of air services liberalization among countries of the European Economic Area (EEA) is estimated to account for approximately 30 per cent higher intra-EEA passenger traffic compared with countries that signed Open Skies-type agreements. Our results are robust to the use of several measures of liberalization as well as alternative estimation techniques that address potential problems of endogeneity, heteroscedasticity and data inaccuracy.

Keywords: Air Services Agreements; Air services liberalization; Air passenger traffic; Regulatory quality.

JEL classification: F15, L93, R48.

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1. Introduction

Air transport has rapidly expanded in the last few decades. Passenger traffic experienced an average annual increase of five to nine per cent between 1960 and 2004 (Hanlon, 2006). Air cargo grew even faster in recent years. Hummels (2007) reports that ton-miles shipped by air increased by 11.7 per cent in the period 1975-2004. The reason for this rapid expansion is the substantial decline of air transport costs. Air transport costs decreased by 92 per cent between 1955 and 2004. The largest drop, equal to 8.1 per cent annually, took place over the period 1955-1972, the period when the use of jet engines became wide spread (Hummels, 2007).

Technological progress apart, changes in the regulatory set-up may have helped reducing air transport costs as well. The regulatory regime that governs international air transport has been heavily regulated by governments since the International Civil Aviation Conference in 1944. Absent a multilateral agreement,[1] over 3500 bilateral and plurilateral Air Services Agreements have been signed worldwide. A first significant step in the liberalization process was taken in 1992, when the United States signed its first Open Sky Agreement with the Netherlands that lifted up in particular regulations on capacity of services offered. Since then, the United States have signed over 60 Open Skies and the countries of the European Economic Area have set very liberal conditions for air services in their region. However, significant restrictions remain in the aviation market and the result is a very complex web of different types of regimes under which air companies operate. Therefore, interesting empirical questions are whether air services liberalization has had a significant impact on the performance of the aviation industry and, more specifically, how effective different types of agreements have been in improving market competition, lowering transport costs and increasing traffic volumes.

The empirical evidence addressing these questions is scarce and existing studies tend to focus on a limited number of countries, thus covering only one or a few types of Air Services Agreements. In a study specific to the Open Skies Agreements signed by the United States, Micco and Serebrisky (2006) show that Open Skies Agreements reduced nominal air cargo transport costs by nine per cent between 1990 and 2003 and increased the share of imports arriving by air by seven per cent. In particular, they find the results to be driven by Open Skies Agreements with middle and high income countries while they do not find significant effects of Open Skies Agreements for low income countries. Focusing on thirteen OECD countries, Gönenç and Nicoletti (2000) estimate positive and significant effects of air services restrictiveness on passenger air fares. Doove et al. (2001) extend the analysis to a group of 35 economies, but the focus remains on OECD countries with only ten non-OECD members included.

The aim of this paper is to fill this gap in the literature by quantifying the economic impact of a certain degree of air services liberalization and of different types of agreements for a large sample of countries. To this purpose we use a worldwide sample of nearly 2300 country pairs covering 184 countries, where information on Air Services Agreements in force in 2005 is available. In order to be able to work with such a large sample, we focus on the impact of Air Services Agreements on bilateral passenger flows. As shown in Table 1, the available information on Air Services Agreements covers approximately 80 per cent of worldwide international scheduled passenger traffic in 2005 (545 million passengers out of a total 688 million passengers worldwide)[2] and provides a good representation of the distribution of passenger flows by income group.

Understanding the determinants of air passenger flows is important first of all because air passenger

[1] Air transport services are excluded from GATS, the WTO multilateral agreement on trade in services.

[2] Scheduled traffic accounts for 85 per cent of total passenger traffic, that is including also charter flights (Gönenç and Nicoletti, 2000). Furthermore, Air Services Agreements typically refer to rules for scheduled flights.

Table 1: International air passengers by income group of countries, 2005

	Total traffic			Traffic covered by our sample		
Income Group	Low	Middle	High	Low	Middle	High
Low	1%	2%	5%	1%	1%	3%
Middle		5%	31%		4%	29%
High			51%			61%
Total	**100% (688 millions)**			**100% (545 millions)**		

Notes: Low, middle and high income countries correspond to World Bank (2008). Percentages do not add up to 100, because of missing information on the level of income for some countries.
Source: Authors' calculations based on IATA On-Flight Origin-Destination Statistics 2005.

transport plays a crucial role in the process of international integration. Passenger transport is essential for face to face communication in business relations, which is in turn important for trade (Rauch and Trindade, 2002; Herander and Saavedra, 2005). Second, air passenger transport substantially affects other sectors in the economy, such as international tourism. Finally, investigation of passenger traffic provides also a rough indication of trends on cargo shipped by air. In fact, 50 per cent of overall amount of cargo is transported on passenger flights rather than dedicated cargo flights, using the otherwise empty belly space or "combi operations" (OECD, 2000).

We estimate the impact of Air Services Agreements on bilateral passenger flows using a gravity-type model augmented for the degree of liberalization of the regulatory regime.[3] The underling idea is that the extent of liberalization of the aviation market is likely to influence the toughness of competition. An increase in the toughness of competition may lower prices or improve the quality of the services offered, thus increasing passenger traffic. As expected, we find a positive and significant impact of air services liberalization on passenger traffic. For instance, we estimate that liberalizing the regulatory regime of air services between the Czech Republic and Mexico from its current level (corresponding to the 25th percentile) to that in force between the United States and New Zealand (falling in the 75th percentile) would increase passenger traffic by approximately 30 per cent.

A standard problem in studies that estimate the economic impact of air services liberalization is that of a possible endogeneity of the policy variable. We develop a relevant instrument for the degree of air transport liberalization and address the endogeneity issue by estimating our empirical model using instrumental variable technique. Another difficulty in looking at the impact of Air Services Agreements on bilateral passenger traffic is the potential mismatch between bilateral passenger traffic data (that include passengers flying via a third country) and the relevant regulation. Since this type of mismatch is more likely on long-hauls, we address this issue by testing the robustness of our results on short-distance flights.

Furthermore, we analyze the sensitivity of our results to several measures of the degree of liberalization in the aviation market. We compare two indexes of the overall degree of liberalization of air services. One is an index recently developed by the WTO Secretariat (WTO, 2006) in consultation with experts in the aviation industry, where different provisions introduced by the agreements are weighted on the basis of their importance in experts' opinion in liberalizing air services. The other is a statistical index built using factor analysis as proposed by Nicoletti et al. (2000) and used in Gönenç and Nicoletti (2000). Finally, we implement an original approach that combines estimation results obtained for individual features of

[3]Focusing on intra-APEC passenger flows a similar approach has been adopted by Geloso Grosso (2008).

agreements with cluster analysis to identify different types of existing Air Services Agreements and estimate their impact on traffic volumes.

The rest of the paper is organized as follows. Section 2 introduces the features of Air Services Agreements that are considered to be relevant indicators for market access liberalization. Section 3 presents two different indexes of the degree of liberalization of the aviation market and describes the extent of air services liberalization worldwide. Section 4 explains our methodological approach, whereas Section 5 presents the results. Finally, section 6 concludes.

2. Main Features of Air Services Agreements

Air Services Agreements incorporate many features covering a wide range of issues, including aviation security, incident investigation, immigration and control of travel documents. Only some features are important determinants of the degree of liberalization of the international aviation market. The WTO (2006) study on air services identifies seven features as relevant indicators of increased market access for scheduled air passenger services:

Grant of rights defines the rights to provide air services between the two countries. In particular, the WTO study focuses on fifth freedom, seventh freedom and cabotage. *Fifth freedom* enables the airlines of any two countries to pick up passengers in each other's territories for destinations in other countries. *Seventh freedom* is the right to carry passengers or cargo between two foreign countries without continuing service to one's own country. *Cabotage* is the right of an airline to operate within the domestic borders of another country on a route with origin or destination in its home country;

Capacity clause identifies the regime to determine the capacity of an agreed service. The capacity regime refers to the volume of traffic, frequency of service and aircraft types. Sorted from the most restrictive to the most liberal regime, three commonly used capacity clauses are: predetermination, Bermuda I and free determination.[4] *Predetermination* requires that capacity is agreed prior to the service commencement, *Bermuda I* gives limited right to the airlines to set their capacities without a prior governmental approval and *free determination* leaves the capacity determination out of regulatory control;

Pricing refers to the regime to price air services. The most restrictive regime is that of *dual approval*, whereby both parties have to approve the tariff before this can be applied. The most liberal regime is *free pricing*, when prices are not subject to the approval by any party. The semi-liberal regimes are *country of origin disapproval* (where tariffs may be disapproved only by the country of origin), *dual disapproval* (where both countries have to disapprove the tariffs in order to make them ineffective) and *zone pricing* (where parties agree to approve prices falling within a specific range and meeting certain characteristics, whilst outside the zone one or a combination of the other regimes may apply);

Withholding defines the conditions required for the designated airline of the foreign country to operate in the home country. Restrictive conditions require *substantial ownership and effective control*, meaning that the designated airline is the "flag carrier" of the foreign country. More liberal conditions are required under *community of interests* and *principal place of business* regimes, where a foreign airline can also be designated by the foreign country. While community of interests regime still requires a vested substantial ownership and effective control of the airline in one or more countries that

[4] Two types, "other restrictive" and "other liberal", are distinguished in addition in WTO (2006).

are defined in the agreement, principal place of business regime removes the substantial ownership requirement;

Designation governs the right to designate one (*single designation*) or more than one (*multiple designation*) airlines to operate a service between two countries;

Statistics provides rules on exchange of statistics between countries or their airlines. The fact that an exchange of statistics is (can be) requested is an indicator that the parties intend to monitor the performance of each other's airline. Therefore, it is considered a restrictive feature of an agreement;

Cooperative arrangements define the right for the designated airlines to enter into cooperative marketing agreements (such as code sharing and alliances). This is considered to be a liberal feature because it provides a means to rationalize networks.

As shown in Table 2, the most restrictive regimes are the most frequent with respect to pricing, capacity and ownership. Cooperative arrangements are in general not allowed and exchange of statistics tends to be required. In contrast, multiple designation dominates single designation. Among the freedoms of air, the fifth freedom is the most frequent, while the seventh freedom and cabotage are rare.

Table 2: Number of Air Services Agreements by provision

Provision	Frequency	Provision	Frequency
Grant of rights		**Withholding**	
Fifth freedom	1650	Substantial ownership and effective control	1735
Seventh freedom	417	Community of interest	396
Cabotage	353	Principal place of business	138
Missing values	0	Missing values	59
Pricing		**Capacity**	
Dual approval	1625	Predetermination	1324
Country of origin disapproval	37	Other restrictive	125
Dual disapproval	153	Bermuda I	327
Zone pricing	8	Other liberal	10
Free pricing	381	Free determination	464
Missing values	94	Missing values	49
Designation		**Statistics**	
Single	879	Exchange of statistics required	1492
Multiple	1411	Exchange of statistics not required	807
Missing values	9	Missing values	0
Cooperative arrangements			
Not allowed	2173		
Allowed	126		
Missing values	0		

Notes: The total number of agreements available is 2299. The frequencies of fifth freedom, seventh freedom and cabotage do not sum up to 2299 observations, because these provisions are not mutually exclusive. Similarly, some agreements present combinations of ownership regimes.
Source: Authors' calculations based on ICAO (2005) and WTO (2006, 2007).

3. The Degree of Air Services Liberalization

The overall degree of liberalization introduced by a certain agreement depends on its specific design. Indexes allow to summarize the various features of an agreement in a single figure, by assigning a weight to each provision included in the agreement. Such weight denotes the provision's marginal contribution to the liberalization of the aviation market. There are two plausible ways to assign reasonable weights. One is to rely on expert knowledge. The other one is to use a purely statistical technique such as factor analysis. To get a better understanding of the overall degree of liberalization of the international aviation market we use both types of indexes.

The air liberalization index (ALI) constructed by the WTO Secretariat (WTO, 2006) is an expert-based index. The weights assigned to the different provisions of an agreement were defined in consultation with a group of experts on aviation industry with the view to capture the relative importance of each provision in liberalizing the sector. As a result, each provision got a weight between 0 and 8 and the ALI ranges between 0 and 50, where 0 is associated with the most restrictive agreement and 50 denotes the most liberal agreement.[5]

Following the approach of previous empirical literature (Gönenç and Nicoletti, 2000), we construct a second index of air services liberalization by means of factor analysis (see Appendix A). This statistical index (factor analysis index or FAI) ranges between 0 and 1 and increases with the degree of liberalization of the aviation market.[6]

The comparison between the relative importance that each indicator of liberalization takes in these two indexes shows that grant of rights and withholding have a relative higher weight in the ALI than in the FAI, while the opposite is true for statistics and cooperative arrangements (see Table 3). Nevertheless, overall the ALI and the FAI are highly correlated with a correlation coefficient of 0.97 and a Spearman correlation coefficient based on the countries-pair ranking equal to 0.92. This is a result of a typically high correlation among individual indicators of liberalization within an agreement (see Section 5.2 for more details). Average values of ALI and FAI by country are reported in Appendix B.

Table 3: The informed index (ALI) and the statistical index (FAI)
Comparison of weighting schemes

Indicators of liberalization	ALI weights	FAI weights
Grant of rights	0.36	0.17
Capacity	0.16	0.17
Pricing	0.16	0.18
Withholding	0.16	0.1
Designation	0.08	0.08
Statistics	0.02	0.11
Cooperative arrangements	0.06	0.19
Sum of weights	**1**	**1**

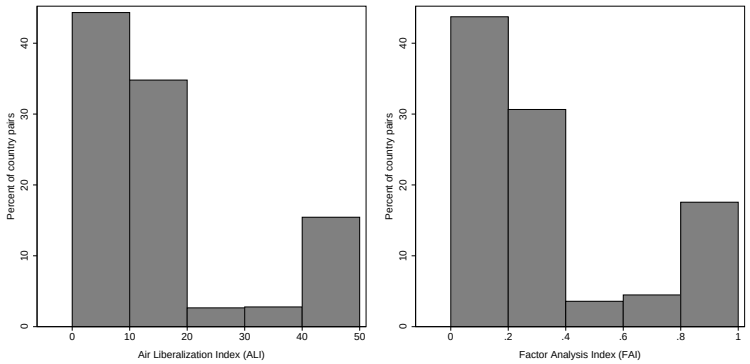
Notes: The weights reported for the ALI are not the original ones, but they are adjusted to sum up to 1 for a better comparison with the weights of the FAI. Definition of the indicators of liberalization can be found in Appendix A.
Source: Authors' calculations based on ICAO (2005) and WTO (2006, 2007).

[5]There are four weighting schemes proposed by WTO (2006). However, the resulting indexes are highly correlated (over 90 per cent correlation). Therefore, in this paper we report the results only for one of them, the standard ALI.

[6]Note that the constructed FAI is broadly consistent with the index of bilateral restrictiveness (the BRI) calculated by Gönenç and Nicoletti (2000) with a high negative correlation coefficient of -0.84.

As shown in Figure 1 both indexes present a distribution highly skewed towards the left. Overall, existing agreements provide a limited degree of liberalization of the aviation market. Approximately 70 per cent of agreements are very restrictive with an ALI (FAI) below 15 (0.4). Very few agreements introduce an intermediate degree of liberalization. A high degree of liberalization with an ALI over 40 is reached only in 15 per cent of country-pairs. This is mainly due to the liberalization of air services among countries in the European Economic Area for which the ALI takes a value of 43.

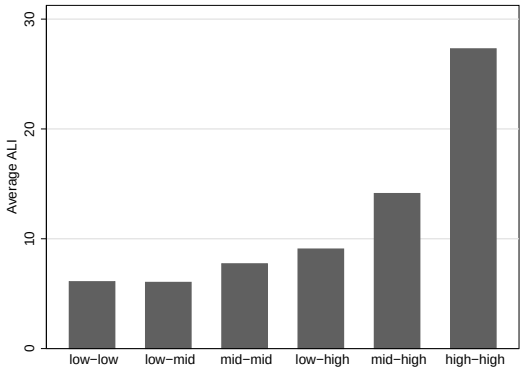
Figure 1: Histograms of the degree of international air services liberalization



Source: Authors' calculations based on ICAO (2005) and WTO (2006, 2007).

An interesting aspect of the complicated web of regulation set up by the Air Services Agreements is to what extent they liberalize aviation markets in developing relative to developed countries. Figure 2 reveals that the higher the income of the countries, the more liberal agreements tend to be signed between the countries.

Figure 2: International air services liberalization by income level



Note: Low, middle (mid) and high income countries correspond to World Bank (2008).
Source: Authors' calculations based on ICAO (2005) and WTO (2006, 2007).

4. The Empirical Model

The gravity model is the workhorse model to analyze international trade flows, but it is also used to describe migration flows and trip distributions in general. To assess the impact of air services liberalization on the international aviation market, we adjust the gravity model for modeling bilateral air passenger traffic and estimate it in the following log-linear form:

$$\begin{aligned}\log(\textit{traffic}_{ij}) =& \beta_0 + \beta_1 \textit{air liberalization}_{ij} + \beta_2 \textit{ASA age}_{ij} + \beta_3 \log(\textit{distance}_{ij}) + \\ &+ \beta_4 \textit{border}_{ij} + \beta_5 \textit{colony}_{ij} + \beta_6 \textit{language}_{ij} + \sum_k \gamma_k D_{ijk} + \epsilon_{ij}, \end{aligned} \tag{1}$$

where $\log$ denotes the natural logarithm and ϵ_{ij} is an error term.

The dependent variable (the log of) $\textit{traffic}_{ij}$ is the total number of air passengers traveling between country i and country j in 2005. Our explanatory variable of interest, $\textit{air liberalization}_{ij}$, denotes the degree of air services liberalization between the two countries in the corresponding year. As discussed in section 3, this is measured by the ALI and the FAI. Nevertheless, we also use individual provisions as well as types of agreements as broader measures of the degree of liberalization. We expect that the degree of liberalization of air passenger services has a positive impact on the number of air passengers. To the extent that Air Services Agreements by improving market access to foreign markets introduce more competition in the sector and allow for a better rationalization of the air services, they will yield lower air fares and/or better quality of the air services. Consumers can be expected to respond to these changes by flying more.

We further augment the standard gravity model with a variable capturing the number of years ($\textit{ASA age}_{ij}$) since the first Air Services Agreement has entered into force. This variable attempts to account for the effective implementation of an agreement and the more likely realization of its pro-competitive effects. We expect this variable to positively affect passenger flows.

The other variables in equation (1) are the standard gravity regressors. In particular, the variables $\textit{distance}_{ij}$, $\textit{border}_{ij}$, $\textit{colony}_{ij}$ and $\textit{language}_{ij}$ denote the distance in kilometers between the most populated cities in countries i and j, whether the two countries share a common border, a colonial link or a common official language, respectively. We adopt the approach suggested in Anderson and van Wincoop (2003) and include country fixed effects (denoted as D_{ijk}) to account for any country specific factor that may determine differences in the number of passengers across countries such as GDP. D_{ijk} is defined as a 0-1 dummy equal to 1 when a country k is either country i or country j. Since our dependent variable is symmetric we do not distinguish whether the country k is the country of origin or the destination country.

We expect all the standard gravity regressors to have the usual effect on passenger traffic, except for the border dummy. In the gravity models applied to trade flows, this effect is in general estimated to be positive and significant. Instead, in the case of air transport services, we expect a negative impact of adjacency of countries on the number of passengers. The reason is that the existence of a common border makes it easier for people to use alternative means of transport to air transport (e.g. rail and road) to travel between two countries.

Data sources for all variables used are provided in Appendix C.

5. The Results

We start estimating equation (1) using the standard OLS estimation method with robust standard errors. The results reported in Table 4, column 1, show a positive and significant effect of air services liberalization

on passenger flows. In particular, an increase in the degree of liberalization from the 25th percentile (when ALI = 6) to the 75th percentile (when ALI = 34) is estimated to increase traffic volumes by 29 per cent.[7] We also find a positive and significant coefficient for the number of years since the first Air Services Agreement was signed between two countries. This is in line with the expectation that older agreements are more likely to be effectively implemented. Agreements with an *ASA age* of 43 years (75th percentile) are related on average to traffic volumes around 23 per cent higher than those with an *ASA age* of 12 years (25th percentile). All coefficients of the other explanatory variables have the expected sign and are significant. Overall, the gravity model explains an important proportion of the variance of the data, with an adjusted R^2 over 0.75.

Table 4: Determinants of international passenger flows
The role of Air Services Agreements

	Dependent variable: log(traffic)				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Full sample	**Distance < 8000 km**	**Distance < 5000 km**	**Distance < 5000 km & no low-low income**	**Distance < 5000 km & no high-high income**
ALI	0.0090***	0.015***	0.022***	0.023***	0.012*
	(0.01)	(0.00)	(0.00)	(0.00)	(0.10)
ASA age	0.0066***	0.0055**	0.0053**	0.0047*	0.0020
	(0.00)	(0.01)	(0.03)	(0.05)	(0.46)
Log(distance)	-0.91***	-0.84***	-0.78***	-0.76***	-0.86***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Border	-0.23*	-0.20	-0.29**	-0.38**	-0.050
	(0.08)	(0.13)	(0.04)	(0.01)	(0.75)
Colony	0.54***	0.47***	0.37**	0.42**	0.28
	(0.00)	(0.00)	(0.04)	(0.02)	(0.20)
Language	0.57***	0.60***	0.57***	0.51***	0.87***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Country dummies	YES	YES	YES	YES	YES
Observations	1299	1113	910	853	641
Adjusted R^2	0.75	0.75	0.76	0.76	0.71

Notes: ***, ** denote significance at 1 and 5 per cent significance level, respectively. P-values reported in parentheses. Estimates are based on OLS with robust standard errors.

A typical problem commonly neglected in the literature on air services liberalization is the bias that may be introduced by a possible mismatch between the air transport regulation in force between two countries and the regulation applying to each of the passenger flying between the two countries. Data on the number of passengers traveling between two countries (A and B) typically refer to the true origin and true destination of each passenger. This type of data does not allow to distinguish between passengers flying directly and

[7] The formula to compute this effect is $\exp(0.0090 * (34 - 6)) - 1) * 100\%$

passengers flying via a third country. For example, if a passenger travels from country A to country B via (unknown) country C, the rules governing his/her trip are not those established by the Air Services Agreement between countries A and B, but those established by the agreements between countries A and C and between countries B and C.

In order to minimize this potential bias, we estimate equation (1) only for the sample of country-pairs that are connected by a direct air service. When a direct service between two countries exists, we can reasonably assume that most of the bilateral passenger traffic is regulated on the basis of the bilateral agreement signed by the two countries. In fact, case studies suggest that the number of passengers traveling via a third country when a direct service exists is a small percentage of total passenger flows.[8] In contrast, when there is no direct flight, the degree of air service liberalization defined in the agreement between two countries does not represent the conditions under which airlines operating the indirect connection work.[9]

In columns from 2 to 5 we check the robustness of our results to different sub-samples. To further address the mismatch in the passenger data and the regulatory data, we run regressions on sub-samples of country pairs with distance below 8000 and 5000 km. The underlying idea is that passengers are more likely to fly directly on shorter distances, because stopovers prolong the total duration of a travel relatively more on short-distance than on long-distance flights and because short-distance flights are more frequent. Therefore, we expect a better correspondence between passengers and regulation on short-distance flights than on long-distance flights. We find a stronger impact of air services liberalization on traffic flows in these sub-samples than in the full sample (the ALI coefficient increases from 0.009 up to 0.022). This appears to suggest that the possible problem created by data mismatch does not undermine our results. On the contrary, if any, the bias acts towards underestimating the impact of air services liberalization on the number of air passengers.

In columns 4 and 5 we remove from the sample of short-distance routes country-pairs of two low- and two high-income countries, respectively, to test the sensitivity of our results to different income groups. The estimated coefficient for ALI remains positive and significant.

5.1. Alternative Estimation Methods

A standard problem of studies that look at the impact of liberalization policies is the potential endogeneity of the policy variables. One way in which the endogeneity problem can arise in the model is if countries respond to the actual traffic volumes by signing more liberal agreements. For instance, a country could tend to sign liberal agreements with partners with which it has low traffic volumes in order to promote bilateral traffic. In this case the coefficients resulting from OLS estimations would be biased downwards. On the contrary, OLS will overestimate the impact of liberalization on passenger traffic, if a country tends to sign liberal agreements with partners with which it has already high traffic volumes. In order to address the endogeneity problem, we run an instrumental variable (IV) regression and report the results in Table 5, column 2. The instrument used is constructed as a geometric average of the average levels of the ALI of the two countries in a pair and denoted as the *geometric ALI*.[10]

The rationale for using this instrument is that the average level of air services liberalization of each country across all partners is likely to be exogenous to the bilateral traffic flows with a specific partner.[11]

[8] For example, estimates for a flight London Gatwick-Dallas based on 1996 information show that non-EU passengers are less than 20 per cent of total passengers (Hanlon, 2006). Since London is an important hub for long-haul flights we should expect this percentage to be even lower for other countries and on other routes.

[9] This is confirmed by the data. When we run regressions only for the sample of country-pairs without a direct service link, we find that the coefficient for the ALI is insignificant.

[10] The arithmetic average cannot be used because of perfect collinearity with the country dummies.

[11] In addition, we use the average liberalization level of adjacent countries for the construction of the instrument. The estimation results are very similar to those reported in Table 5.

Table 5: Determinants of international passenger flows
Alternative estimation techniques

	(1)	(2)		(3)	(4)
	OLS	**IV (2SLS)**		**Poisson**	**NB**
		First Stage	**Second stage**		
Dependent variable:	**log(traffic)**	**ALI**	**log(traffic)**	**traffic**	**traffic**
ALI	0.0090***		0.018***	0.020***	0.0094***
	(0.01)		(0.00)	(0.00)	(0.00)
ASA age	0.0066***	-0.0082	0.0066***	0.0033	0.0038**
	(0.00)	(0.56)	(0.00)	(0.37)	(0.02)
Log(distance)	-0.91***	-3.43***	-0.87***	-0.79***	-0.97***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Border	-0.23*	-1.13	-0.23**	-0.21	-0.08
	(0.08)	(0.16)	(0.02)	(0.27)	(0.46)
Colony	0.54***	-3.40***	0.58***	0.41**	0.57***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)
Language	0.57***	1.11*	0.55***	0.37**	0.57***
	(0.00)	(0.09)	(0.00)	(0.02)	(0.00)
Geometric ALI		4.52***			
		(0.00)			
Country dummies	YES	YES	YES	YES	YES
Observations	1299	1299	1299	1299	1299
Adjusted/Pseudo R^2	0.75	0.83	0.78	0.87	0.08

Additional NB estimation results:

Overdispersion LR test of $\alpha = 0$: $\hat{\alpha} = 0.48$, p-value = 0.00 (in estimation without robust standard errors)

Notes: ***, **, * denote significance at 1, 5 and 10 per cent significance level, respectively. P-values reported in parentheses. Robust standard errors used in (1), (3), (4). Adjusted R^2 reported in (1), adjusted centred R^2 in (2) and McFadden's Pseudo R^2 in (3) and (4). Equation (1) is estimated in its multiplicative form in (3) and (4), i.e. not in the log-linear specification. The NB2 specification as defined in Cameron and Trivedi (1998) is used for the NB regression in (4).

The results obtained using the IV estimation confirm a positive and significant effect of the degree of air services liberalization on the number of passengers. The coefficient of the ALI estimated with the IV method is higher than that estimated with OLS. This supports the hypothesis that endogeneity arises because countries tend to sign more liberal agreements with the intention to promote initially low traffic flows.

To further check the robustness of our results to different estimation techniques, we also use the Poisson and the Negative Binomial (NB) estimation methods. These techniques take into account that bilateral passenger traffic is a count variable, i.e. non-negative and discrete, and address the heteroscedasticity in the data (Silva and Tenreyro, 2006). The results of these regressions are reported in Table 5, columns 3 and 4. The coefficient for the ALI remains positive and significant. The more flexible NB regression turns out to be more suitable than the Poisson regression according to the test for overdispersion and the coefficients

obtained by the NB appear to be very similar to those of OLS in column 1. Although the NB is a methodology explicitly designed for count data, OLS estimation is in our case also a satisfactory method. The reason is that the values of the count variable are large and dispersed and, thus, the characteristics of the variable are similar to those of a continuous variable. The average number of passengers in our sample is over 410,000 passengers.

In conclusion, the most conservative estimate regarding the variable of interest is obtained by the standard OLS estimation method. For this reason the results presented hereafter are those obtained using this method.

5.2. Alternative Measures of Liberalization

We also test the robustness of our results to the use of alternative measures of air service liberalization. Table 6 shows the estimated effects of increasing the degree of liberalization from the 25th to the 75th percentile using the ALI and the FAI. The results are broadly consistent, with a slightly higher estimate for the FAI (33 per cent increase in the number of passengers) than for the ALI (29 per cent increase).

Table 6: The informed index (ALI) and the statistical index (FAI)
Comparison of estimated effects

Index	Estimated coefficient	Range (min-max)	25th percentile	75th percentile	Estimated effect
ALI	0.0090***	0-50	6	34	29%
	(0.01)				
FAI	0.44***	0-1	0.08	0.73	33%
	(0.01)				

Notes: ***, ** denote 1 and 5 per cent significance level, respectively. Estimated coefficients are obtained by OLS with robust standard errors using the same specification as in Table 4, column 1. P-values reported in parentheses. The column titled "Estimated effect" reports the estimated impact on passenger volumes of an increase in the index from the 25th to the 75th percentile.

Overall measures of the degree of liberalization, such as the ALI and FAI, do not allow to single out which specific provision has the largest impact on passenger flows. It is very difficult to disentangle the effect of each provision on passenger flows, because restrictive (liberal) provisions tend to go hand in with other restrictive (liberal) provisions within one agreement which leads to high correlation among the provisions. For instance, 96 per cent of agreements with the restrictive dual approval pricing regime also require withholding regime of substantial ownership and effective control.

To address the issue of multicollinearity and to understand which existing type of agreement has the largest impact on international passenger flows, we turn to the application of cluster analysis on the various provisions. Cluster analysis is a suitable tool to distinguish different types of agreements, because it classifies objects (agreements) into different groups (clusters) according to their "similarity". In the analysis that follows, we use agglomerative hierarchical cluster analysis (Härdle and Simar, 2007) that takes each observation as a separate cluster at the beginning and merges them successively into larger and larger clusters.

We conduct cluster analysis in two steps. First, running separate gravity regressions, one for each provision of an agreement, we identify the provisions that have a significant effect on passenger flows. Seven of these provisions (seventh freedom, cabotage, free determination of capacity, free pricing, community of interest, multiple designation and no requirement for statistical exchange) turn out to have a positive effect on passenger flows. Other three provisions (dual approval, country of origin disapproval, substantial ownership

and effective control) are found to reduce passenger flows. Second, we use these ten provisions as distinguishing features for the cluster analysis. The first level of aggregation reveals twenty-eight different types of existing agreements. In order to obtain more balanced clusters in terms of the number of agreements, we opted for higher levels of aggregation.

Table 7 part (1) displays seven clusters obtained at the twenty-first level of aggregation. This level turned out to be reasonable in terms of the number of observations in each cluster and in terms of explanatory power in the gravity regressions. Clusters are ordered from the most restrictive to the most liberal type (from C1 to C7) and for each cluster the percentage of agreements characterized by a certain provision is reported. For instance, cluster C1 includes the most restrictive types of agreements, none of which contains a liberal feature. Three types of agreements denoted by clusters C1, C3 and C7, respectively, are very frequent and account together for more than 90 per cent of Air Services Agreements.

Table 7: Cluster analysis and the role of types of agreements

Part (1) Clusters							
Clusters	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**
Observations	291	45	319	64	64	61	305
Liberal provisions							
Seventh freedom	0	0	0	0	0	33	100
Cabotage	0	0	0	0	0	0	92
Free determination of capacity	0	0	0	0	3	90	100
Free pricing	0	0	0	0	0	2	100
Community of interest	0	0	0	0	0	0	99
Multiple designation	0	0	100	100	89	93	100
Exchange of statistics not required	0	100	0	100	2	89	100
Restrictive provisions							
Dual approval	100	100	100	100	14	8	0
Country of origin disapproval	0	0	0	0	27	3	0
Substantial ownership and effective control	100	100	100	100	75	100	0
Part (2) Regression results							
Coefficient	ref.	-0.11	0.070	0.21#	-0.066	0.39*	0.57***
P-value	.	(0.48)	(0.41)	(0.12)	(0.64)	(0.09)	(0.00)
Estimated effect	ref	.	.	23%	.	48%	77%

Notes to Part (1): Percentage of agreements containing corresponding provision within each cluster are reported. The dual approval and country of origin disapproval are mutually exclusive. Incomplete agreements are excluded. Clusters were obtained by Wards clustering algorithm using Jaccard binary measure of similarity.

Notes to Part (2): ***, **, *, # denote 1, 5, 10 and 15 per cent significance level, respectively. Ref denotes the omitted reference cluster. P-values reported in parentheses. The row titled "Estimated effect" refers to the impact of the corresponding type of agreements on passenger volumes as compared to the agreements in the reference cluster. Estimates are based on OLS with robust standard errors using the same specification as in Table 4 except that dummies for different clusters of agreements are used instead of the ALI.

Using the standard gravity model to explain bilateral passenger flows, we estimate the impact of different types of agreements by adding to the standards explanatory variables six dummies, one for each cluster. We

report the results in Table 7 part (2). The agreements falling in clusters C4, C6 and C7 have an increasingly positive and significant effect on passenger flows relative to the most restrictive agreements of cluster C1 that form a reference group.

The most liberal cluster C7 is found to have the largest impact on the number of passengers. Passenger traffic is estimated to be 77 per cent higher among countries applying these types of regulations than among countries falling in the most restrictive cluster C1. Cluster C7 includes all country pairs covered by the Air Transport Agreement between EU and Switzerland and the European Economic Area involving the EU countries, Norway, Iceland and Liechtenstein as well as two bilateral agreements of New Zealand (with Brunei Darussalam and with Singapore). In particular, this result shows the importance of free pricing, seventh freedom, cabotage rights and the removal of a requirement for substantial ownership and effective control for an effective liberalization of international air services.

Cluster C6 is the second most liberal cluster identified. It includes 45 Open Skies Agreements signed by the United States and gathers agreements with multiple designation, free determination of capacity, price regimes other than dual approval and no requirement of statistical exchange. Passenger traffic related to this cluster is estimated to be approximately 48 per cent higher than in cluster C1.

The positive coefficient for cluster C4 shows the importance of multiple designation in combination with no request of statistical exchange. These features together are associated with an increase in traffic by 23 per cent compared to the most restrictive agreements of cluster C1. Although 86 per cent of country pairs belonging to this group include a middle income country, the countries that most frequently appear in this group are the United States and France (in 8 agreements), Tunisia and Brazil (in 6 agreements) and Paraguay (in 5 agreements).

6. Conclusions

The aviation industry has been highly regulated both domestically and internationally, with governments setting conditions on ownership, capacity and fares. The conditions under which air companies operate between two countries are typically set by bilateral Air Services Agreements and in few cases, plurilateral agreements apply. Although in the last 30 years countries have undertaken a process of liberalization of the industry, the outcome of this process has been a very unevenly liberalized global aviation market, where high income countries tend to sign less liberal agreements with low income countries than with middle and high income countries.

In order to assess the economic impact of the present system of Air Services Agreements, this paper focuses on international air passenger transport, an important factor in facilitating trade and in the development of other sectors of an economy such as tourism. Relying on detailed information on the regulatory set up of the aviation market for a sample of nearly 2300 Air Services Agreements, we estimate the impact of a change in the degree of air services liberalization on the volume of international passenger flows.

We find strong evidence of a positive and significant impact of the degree of liberalization of the international aviation market on passenger traffic. In particular, we estimate that increasing the degree of liberalization from the 25th to the 75th percentile increases passenger traffic by approximately 30 per cent. Furthermore, the analysis of the types of agreements revealed, for instance, that the higher degree of air services liberalization among countries of the European Economic Area relative to the US Open Skies Agreements accounts for 29 per cent higher passenger traffic. Our results point at the importance of introducing provisions for free pricing, seventh freedom, cabotage and the removal of substantive ownership and effective control requirement for an effective liberalization of the international aviation market.

More research is needed to quantify the impact of Air Services Agreements on cargo traffic. However, the results of this paper suggest a very important policy implication. The present system of a plethora of

Air Services Agreements characterized by a variety of degrees of liberalization generates a discriminatory environment for access to air services. This discrimination appears to be particularly penalizing for low income countries that tend to sign less liberal Air Services Agreements. They may be the primary beneficiary of an improved access to the international aviation market.

Appendix A. Construction of the Factor Analysis Index (FAI)

We construct the Factor Analysis Index (FAI) following the approach introduced by Nicoletti et al. (2000). The seven indicators of liberalization identified in WTO (2006) are taken as the initial set of variables on which factor analysis is applied. Table 8 provides the definition of each indicator. The most restrictive and the most liberal provision within an indicator are associated with 0 and 1, respectively.

Table 8: Definition of indicators of liberalization

Name of indicator	Definition
Grant of rights	categorical variable that takes the values 0, $1/3$, $2/3$ or 1 depending on the number of traffic rights (fifth freedom, seventh freedom, and cabotage) provided by the agreement (0 means that none of the traffic rights is provided, $1/3$ refers to one traffic right provided, $2/3$ to two rights and 1 means that all three traffic rights are provided)
Capacity	categorical variable that takes the values 0, $1/4$, $2/4$, $3/4$ or 1 depending on the capacity clause (0 refers to predetermination, $1/4$ to "other restrictive" regime, $2/4$ to Bermuda I, $3/4$ to "other liberal" regime and 1 to free determination)
Pricing	categorical variable that takes the values 0, $3/8$, $4/8$, $6/8$, $7/8$ or 1 depending on the pricing regime (0 refers to dual approval, $3/8$ to country of origin disapproval, $4/8$ to zone pricing combined with dual approval, $6/8$ is associated with dual disapproval, $7/8$ refers to zone pricing combined with dual disapproval and 1 refers to free pricing)
Withholding	categorical variable that takes the values 0, $1/2$ and 1 depending on the ownership/withholding regime provided; when more than one regime is included, the less restrictive one is considered (0 refers to substantial ownership and effective control, $1/2$ to community of interests and 1 to principal place of business regime)
Designation	dummy variable that takes the value 1 if multiple designation of airlines is allowed and 0 otherwise
Statistics	dummy variable that takes the value 0 if a provision on the exchange of statistics is included and 1 if the provision is absent
Cooperative arrangements	dummy variable that takes the value 1 if cooperative arrangements are allowed and 0 otherwise

The factor analysis extracts two most relevant factors that together explain 68 per cent of the overall data variation as depicted in Table 9. Factor 1 accounts individually for more than 50 per cent of data variability. The magnitude of its loadings (in general larger than 0.5) shows that it is highly correlated with all indicators of liberalization, but cooperative arrangements. Factor 1 therefore captures an overall degree of liberalization of the agreement. The detection of one common factor for most of the indicators results from strong correlations between them (in the range of 0.30 and 0.82). Factor 2 explains only 16 per cent of the data variability and its main contribution to the overall variance is as an indicator for cooperative arrangements.

Table 9: The statistical index (FAI)
Factors loadings and weights

	Factor 1		**Factor 2**		**Total**
Explained variance	52%		16%		68%
Eigenvalues	3.64		1.10		
Indicators of liberalization	**Loadings**	**Weights**	**Loadings**	**Weights**	**Weights**
Grant of Rights	0.89	0.22	-0.07	0.00	0.17
Capacity	0.89	0.22	0.14	0.02	0.17
Pricing	0.91	0.23	0.13	0.02	0.18
Withholding	0.68	0.13	-0.05	0.00	0.10
Designation	0.50	0.07	0.35	0.11	0.08
Statistics	0.72	0.14	0.14	0.02	0.11
Cooperative arrangements	0.04	0.00	0.96	0.83	0.19
Weights of factors		**0.77**		**0.23**	**1**

Notes: Factor loadings were obtained by the principal component method and after varimax rotation.
Source: ICAO (2005) and WTO (2006, 2007).

We assign a weight to each indicator of liberalization and factor according to the proportion of the variance that is explained by the indicator/factor. More formally, if i denotes an indicator of liberalization and w_i its weight, j a factor and W_j its weight, V_{ij} a weight of indicator i within a factor j and $T_j = \sum_{k=1}^{7} \text{loading}_{kj}^2$, then

$$V_{ij} = \frac{\text{loading}_{ij}^2}{T_j}, \qquad W_j = \frac{T_j}{T_1 + T_2}, \qquad \text{and} \qquad w_i = V_{i1}W_1 + V_{i2}W_2.$$

Appendix B. Air Services Liberalization by Country

	ALI		FAI	
Country	**rank**	**average**	**rank**	**average**
Angola	1	0.67	15	0.08
Papua New Guinea	2	3.60	6	0.06
Mozambique	3	3.67	5	0.06
Burkina Faso	4	3.71	14	0.07
China	5	3.73	13	0.07
Georgia	6	3.83	20	0.08
Sao Tome and Principe	7	4.00	17	0.08
Lesotho	7	4.00	1	0.05
Central African Republic	9	4.25	16	0.08
Yemen	10	4.33	9	0.07
Ukraine	11	4.53	39	0.10
Togo	12	4.62	2	0.05
Niger	13	4.63	19	0.08
Moldova	14	4.71	32	0.10
Iran, Islamic Rep. Of	15	4.74	18	0.08
Kazakhstan	16	4.83	38	0.10
Cameroon	17	4.89	22	0.08
Zimbabwe	17	4.89	37	0.10
Bahamas	19	5.00	118	0.19
Solomon Islands	19	5.00	8	0.07
Fyr Macedonia	21	5.27	48	0.11
Kuwait	22	5.35	7	0.07
Bangladesh	23	5.50	21	0.08
Zambia	24	5.60	28	0.09
Seychelles	25	5.70	11	0.07
Israel	26	5.72	36	0.10
Russian Federation	27	5.78	56	0.12
Benin	28	5.81	44	0.11
Oman	29	5.82	29	0.09
Kyrgyz Republic	30	5.93	46	0.11
Mauritius	31	5.94	12	0.07
Comoros	33	6.00	4	0.06
Guyana	33	6.00	3	0.06
Congo	33	6.00	34	0.10
Korea, Dem. People's Rep. Of	35	6.17	26	0.09
India	36	6.25	27	0.09
Kenya	37	6.32	10	0.07
Somalia	38	6.33	30	0.09
Libyan Arab Jamahiriya	39	6.45	24	0.08
Algeria	40	6.47	51	0.12
Samoa	41	6.50	23	0.08
Uzbekistan	41	6.50	81	0.15
Bulgaria	43	6.57	49	0.12
Côte D'ivoire	44	6.64	25	0.09
Lao People's Dem. Rep.	45	6.67	66	0.14
Burundi	45	6.67	41	0.11

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	ALI		FAI	
Country	**rank**	**average**	**rank**	**average**
Cuba	47	6.68	35	0.10
Bosnia and Herzegovina	48	6.75	60	0.13
Vietnam	48	6.75	59	0.13
Senegal	50	6.76	47	0.11
Romania	51	6.78	42	0.11
Saudi Arabia	52	6.95	50	0.12
Mauritania	53	7.00	58	0.12
Albania	54	7.14	116	0.19
Nigeria	55	7.20	31	0.09
Fiji	56	7.22	43	0.11
Equatorial Guinea	57	7.25	67	0.14
Croatia	57	7.25	71	0.14
Afghanistan	59	7.29	65	0.14
Pakistan	60	7.34	33	0.10
Ethiopia	61	7.43	40	0.10
Mexico	62	7.44	123	0.20
Serbia and Montenegro	63	7.58	100	0.17
Tanzania	64	7.62	75	0.15
Azerbaijan	65	7.67	117	0.19
Morocco	66	7.84	64	0.14
Mali	67	7.86	74	0.15
Iraq	68	7.98	55	0.12
Saint Kitts and Nevis	69	8.00	94	0.16
Chad	69	8.00	52	0.12
Maldives	71	8.08	61	0.13
Turkmenistan	72	8.13	104	0.17
Belarus	73	8.15	76	0.15
Malawi	74	8.19	54	0.12
Thailand	75	8.40	53	0.12
Guinea-Bissau	77	8.50	78	0.15
Bahrain	77	8.50	82	0.15
Philippines	77	8.50	95	0.16
Colombia	79	8.55	125	0.20
Korea, Republic of	80	8.58	72	0.14
Argentina	81	8.58	83	0.15
Tonga	82	8.67	45	0.11
Bolivia	83	8.69	86	0.16
Myanmar	84	8.73	68	0.14
South Africa	85	8.73	91	0.16
Gabon	86	8.75	77	0.15
Tunisia	87	8.78	114	0.18
Turkey	88	8.89	99	0.17
Bolivarian Rep. of Venezuela	89	8.93	89	0.16
Armenia	90	9.00	80	0.15
Syrian Arab Republic	91	9.03	121	0.20
Guinea	92	9.06	90	0.16
Cambodia	93	9.07	85	0.16
Egypt	94	9.08	69	0.14
Congo, Dem. Republic of	95	9.08	79	0.15
Jordan	96	9.29	115	0.19
Barbados	97	9.38	92	0.16

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	ALI		FAI	
Country	**rank**	**average**	**rank**	**average**
Qatar	98	9.42	108	0.17
Botswana	99	9.44	124	0.20
Sri Lanka	100	9.48	88	0.16
Canada	101	9.51	97	0.17
Lebanon	102	9.68	102	0.17
Nepal	103	9.75	73	0.15
Malaysia	104	9.79	87	0.16
Bhutan	105	10.00	62	0.13
Djibouti	105	10.00	62	0.13
Tuvalu	105	10.00	70	0.14
Suriname	105	10.00	57	0.12
Paraguay	105	10.00	122	0.20
Ecuador	110	10.08	120	0.19
Sudan	111	10.09	106	0.17
Brazil	112	10.17	103	0.17
Uganda	113	10.20	112	0.18
Mongolia	114	10.22	111	0.18
Costa Rica	115	10.25	142	0.27
Sierra Leone	116	10.38	93	0.16
Australia	117	10.38	84	0.16
Liberia	118	10.42	119	0.19
Ghana	119	10.46	98	0.17
Uruguay	120	10.47	96	0.16
Indonesia	121	10.52	105	0.17
Brunei Darussalam	122	10.74	113	0.18
Japan	123	10.80	107	0.17
Peru	124	10.93	133	0.23
Cape Verde	125	11.00	140	0.27
Trinidad and Tobago	125	11.00	110	0.18
United Arab Emirates	127	11.10	128	0.21
Dominican Republic	128	11.25	138	0.25
Jamaica	129	11.32	132	0.23
Cook Islands	130	11.33	101	0.17
Rwanda	131	11.40	134	0.23
Guatemala	132	11.43	135	0.24
Panama	133	11.75	143	0.27
Madagascar	134	11.80	139	0.25
Hong Kong, China	135	11.98	109	0.18
Saint Lucia	136	12.00	126	0.20
Namibia	136	12.00	149	0.30
Nicaragua	138	12.20	137	0.25
Singapore	139	12.29	127	0.21
Vanuatu	140	13.00	136	0.24
Gambia	140	13.00	144	0.27
Swaziland	143	14.00	129	0.22
Antigua and Barbuda	143	14.00	129	0.22
Haiti	143	14.00	129	0.22
New Zealand	145	15.68	147	0.28
Nauru	146	15.75	146	0.28
American Samoa	147	16.00	141	0.27
Honduras	147	16.00	163	0.42

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	ALI		FAI	
Country	**rank**	**average**	**rank**	**average**
Chile	149	16.08	158	0.35
Macao, China	150	16.61	145	0.28
Switzerland	151	16.93	148	0.29
Austria	152	17.42	152	0.31
Marshall Islands	153	17.67	155	0.32
Germany	154	17.77	151	0.31
Netherlands	155	17.83	154	0.32
Spain	156	17.98	153	0.32
Grenada	157	18.00	150	0.31
United Kingdom	158	18.93	157	0.34
Belgium	159	19.17	156	0.33
France	160	20.13	159	0.35
Sweden	161	21.53	160	0.38
Italy	162	22.78	161	0.41
Czech Republic	163	22.93	164	0.42
Denmark	164	23.09	162	0.41
El Salvador	165	23.50	177	0.60
Norway	166	24.20	166	0.44
Cyprus	167	24.90	165	0.43
United States	168	24.96	176	0.60
Poland	169	26.65	167	0.47
Finland	170	26.75	168	0.48
Greece	171	28.67	169	0.50
Portugal	172	28.87	171	0.52
Hungary	173	28.89	170	0.51
Luxembourg	174	30.57	172	0.55
Malta	175	32.92	173	0.59
Slovenia	176	33.74	174	0.60
Latvia	177	33.75	175	0.60
Aruba	178	34.00	183	0.80
Netherlands Antilles	178	34.00	183	0.80
Ireland	180	35.00	178	0.63
Lithuania	181	35.55	179	0.63
Slovak Republic	182	35.88	180	0.64
Iceland	183	39.06	181	0.71
Estonia	184	41.43	182	0.74

Appendix C. Data Sources

Data on distance, common border, common colonial link and common language were obtained from CEPII (2008). The grouping of countries by level of income corresponds to World Bank (2008). Data on passenger traffic and on the existence of direct services between two countries are from the International Aviation Transport Association (IATA). Information on the agreements and the number of years since they were first signed come from the World's Air Services Agreements (WASA) database provided by International Civil Aviation Organization (ICAO, 2005). This database covers 2204 bilateral Air Services agreements, but only 1921 of these are used, since the rest is covered by plurilateral agreements. Information on plurilateral agreements is obtained from WTO (2007). In particular, we include the Air Transport Agreement between EU and Switzerland and the Agreement on the European Economic Area (EEA) involving the EU (25) countries, Norway, Iceland and Liechtenstein. We ignore other plurilateral agreements because their effective implementation is improbable (see WTO, 2007, Chap. I for more details). The informed index of air transport liberalization, the ALI, is from WTO (2006, 2007). All data collected are for the year 2005.

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