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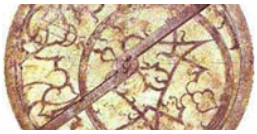

LIBERALISING AIR CARGO SERVICES IN APEC

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ABSTRACT

This working paper aims at making a preliminary assessment of the prospects for a more liberal air cargo regime in the Asia Pacific region. Initial estimates from the gravity equation, employing data on air transport regulation developed by the WTO Secretariat, find a positive and statistically significant relationship between relaxing restrictions and merchandise trade. Cabotage rights, capacity and tariff regulation turn out to be the most important liberalisation factors, with results robust to different specifications controlling for fixed effects. Evidence of positive correlation with trade is also found for multiple airline designation, although these estimates are somewhat less robust.

[1] The author is a Trade Policy Analysts in the OECD Trade and Agriculture Directorate; the views expressed are his own and should not be attributed to the OECD. The author is grateful to Ben Shepherd for initial comments on this working paper.

I. Introduction

Air cargo has experienced solid growth in the Asia Pacific region during the past decade or so and is vital to international trade, representing according to the International Air Transport Association (IATA, 2006) over one third of the value of world merchandise trade. A number of developing countries in the region have become exporters of time sensitive products, such as garments and electronic equipment, as part of developments in global sourcing and manufacturing networks. Air freight often represents the only way to access distant markets in a timely fashion.

Yet, work on the potential impact of reforming the air transport industry has focused on passenger services, with only few studies examining the air cargo component. Micco and Serebrisky (2004), analyse the effects of open skies agreements signed by the US on air transport costs. The study finds that the long-term effect of signing these agreements can reduce air freight costs by 8 percent. Using simple correlation analysis, Kasarda et *al.* (2004) report a statistically significant relationship between aviation liberalisation (defined as the number of existing bilateral agreements) in 63 nations and the volume of air cargo.

The objective of this working paper is to complement and extend existing research by providing a preliminary analysis on the effects of air transport liberalisation on trade in merchandise, focusing on the APEC region. The next section introduces the methodology used for the analysis and Section III the data and descriptive statistics. Section IV then presents the estimation results. The last two sections conclude and list the next steps envisaged to carry the study forward.

II. Methodology

The tool employed in the analysis is the gravity model, the work horse model for analysing the impact of trade costs on trade flows. The model explains bilateral flows as a function of the market size of trading partners, the distance between them and other geographical and institutional variables. The endogenous variable is trade of total merchandise (see Annex I for the details on the methodology used in this study). In addition to GDP and distance, the following controls are used: 1) *common language:* a binary variable which is unity if the country pair has the same language; *border:* 2) a binary variable which is unity if the country pair shares a border; and 3) *historic tie:* a binary variable which is unity if the country pair has historic ties.

The policy variables are the pillars of the bilateral air transport regulatory system as identified by the WTO Secretariat in its recent *Quantitative Air Services Agreements Review (QUASAR)* (WTO, 2006), which draws from information contained in the World Air Services Agreement (WASA) database published by ICAO in 2005. Although the QUASAR has in principle been developed for passenger traffic, most segments of air cargo are also governed by the bilateral air transport system, albeit to somewhat different degrees. In addition, according to IATA, around 50 percent of air freight is carried in the belly-holds of passenger aircraft (quoted in Aviation Week and Space Technology, 7 May 2007) and the share is considered to be even higher in Asia.

As part of QUASAR, the WTO Secretariat has created the Air Transport Liberalisation Index (ALI) by assigning scores to the provisions of bilateral air services agreements (ASAs) deemed to be particularly important for market access.[2] The creation of the ALI has been undertaken in consultation with a group of aviation experts. Initial work was conducted using the ALI and the impact of trade did not result robust to different specifications (see Annex Table 3). These results will require further work but they could be related to the fact that the ALI has been aggregated on the basis of how each restriction would affect passenger traffic, and does not sufficiently take into account the special features of air freight.

The preliminary analysis conducted here thus focuses on the regulatory components of the ALI separately. In particular, the following types of regulatory measures are covered (for a more detailed description of each regulatory measure see Annex II):

1. **Air freedom rights,** the right to carry out services between two parties. *Fifth, seventh and cabotage:* binary variables which are unity if the country pair has a clause allowing for fifth, seventh and cabotage rights.

[2] Scores are between zero and 8 for each restriction, with zero being the most restrictive and 8 being the least restrictive. These scores have then been averaged using weights that are intended to reflect the relative importance of each restriction. The ALI is the sum of the weighted scores obtained by a given ASA. The value of the ALI ranges between zero for very restrictive agreements, and 50 for very liberal ones. The scores attributed can also be altered to take into account the specific situation of a country pair, in particular by giving more weight to: 1) fifth freedom traffic rights (e.g. for geographically remote countries such as Australia and New Zealand); 2) withholding, in particular community of interest and principal place of business; and 3) multiple designation.

2. **Designation,** the right to designate one or more than one airline to exercise the rights to operate the agreed air services. *Multiple designation*: a binary variable which is unity if the country pair has a provision allowing to designate more than one airline.

3. **Capacity,** the regime which determines the capacity in terms of traffic volumes, frequency or regularity of service and aircraft type. *Predetermination, Bermuda I and free determination*: binary variables which are zero if the country pair has a clause stipulating predetermination and Bermuda I; and unity for free determination.

4. **Pricing,** the regime governing the approval of pricing for services between the parties. *Dual approval, dual disapproval, country of origin disapproval, zone pricing and free pricing:* binary variables which are zero if the country pair has a clause providing for dual approval, dual disapproval, country of origin disapproval and zone pricing; and unity for free pricing.

5. **Withholding**, the conditions required for the designated airline of the other party to have the right to operate. *Substantial ownership and effective control, community of interest and principal place of business:* binary variables which are zero if the country pair has a provision requiring substantial ownership and effective control, community of interest or principal place of business.[3]

6. **Cooperative agreements**, the right for the designated airlines to enter into cooperative marketing arrangements. *Cooperative agreements*: a binary variable which is unity if the country pair has a clause for entering into cooperative arrangements.

The model is estimated using the Poission pseudo maximum likelihood (PPML) estimator. As shown by Silva and Tenereyro (2006), the PPML estimator yields unbiased and efficient results in the gravity equation. Furthermore, the PPML estimator allows for the inclusion of zero trade flows, albeit this is not relevant here as no country has reported zero trade flows with the included partners (see below). It is recognised that absolute distance and other trade costs are only a rough measure of the *real* costs between trading partners. As shown by Anderson and Van Wincoop (2003), it is rather relative costs that matter for

[3] There is a fine distinction between free pricing or capacity determination and principal place of business. The former are full liberalisation measures. Principal place of business, although less burdensome than other withholding measures, is still a restriction.

trade flows. Fixed effects are employed to control for this. As a robustness check, in Annex III the regressions are estimated using conventional and fixed effects OLS.

III. The dataset

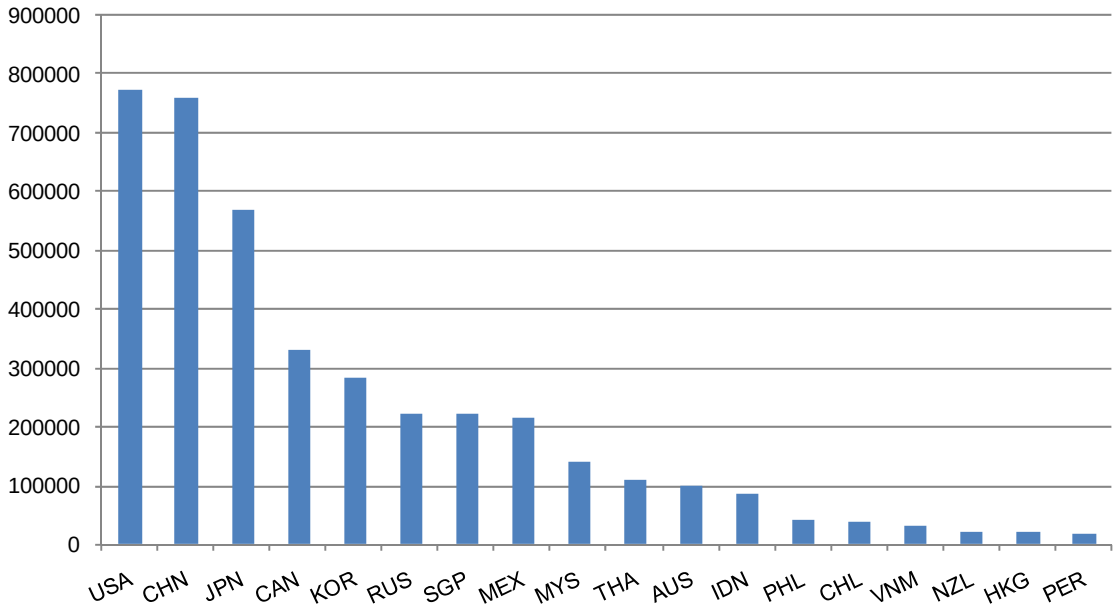
The trade data, trade of total merchandise, are from the UN Comtrade database. As noted, the policy variables are based on the 2005 ICAO's Register of Air Service Agreements, so the regressions are run using a cross-sectional model. The reporters are 18 APEC countries (all members except Chinese Taipei, as it is not an ICAO Signatory; and Brunei Darussalam and Papua New Guinea for which export data are not available) and the partners are all countries which have concluded bilateral ASAs with the included APEC economies. Data on control for GDP are from the World Bank development indicators.

Data for geographical variables are from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). CEPII has created and made available two datasets providing data for empirical economic research including geographical elements and variables.[4] The sources include the CIA World Factbook and the website www.ethnologue.org.

Figures 1 and 2 below present exports and imports of total merchandise for APEC countries for which data are available. The largest APEC exporters and importers are the US, China and Japan. Imports in the US are more than twice larger than exports; China and Japan, on the other hand, are net exporters. Among smaller countries, Singapore has a prominent position.

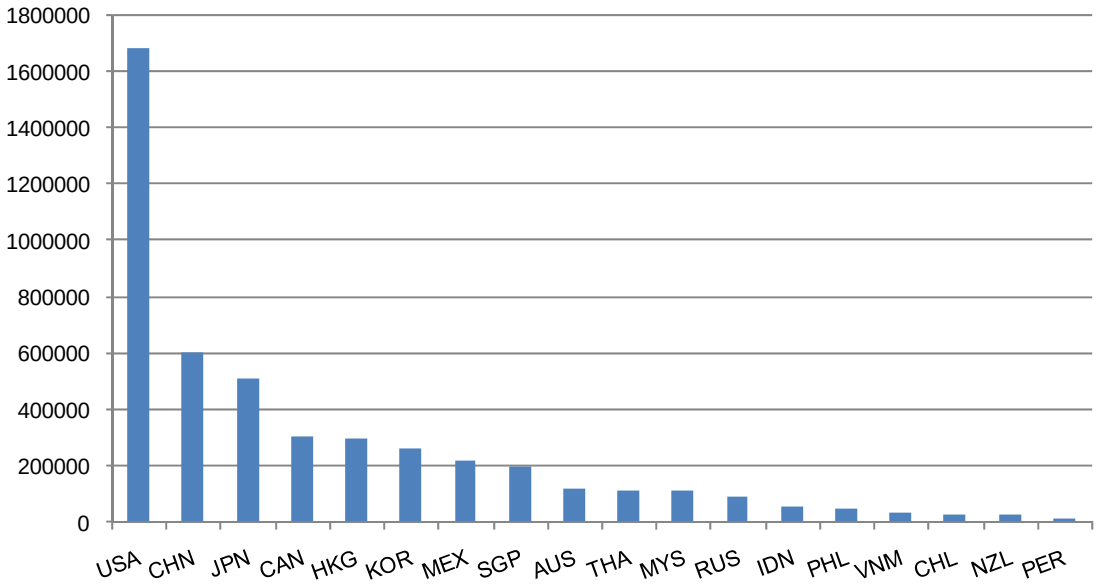
[4] See http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

Figure 1. Total merchandise exports of APEC economies, 2005 (USD millions)



Source: Comtrade.

Figure 2. Total merchandise imports of APEC economies, 2005 (USD millions)



Source: Comtrade.

IV. Estimation results

The results of the gravity equation are presented in Table 1. The regressions are run for the whole sample and for a sub-sample that includes only country pairs with a direct service (mostly non-stop flights but also some flights with a stop-over). Although the Pseudo-R^2 cannot be interpreted as the proportion of variability accounted for by the model, it does indicate a good model fit and is similar in both sub-samples. Annex Tables 1 and 2 further show that the models fit the data quite well and suggest the importance of incorporating fixed effects. Distance, common language (particularly in the full sample), and common border are consistently statistically significant, and with the expected sign. The result for historic ties is surprising, though with OLS this variable is more precisely estimated, particularly in the fixed effects specification.

The estimates for traffic rights indicate that in the full sample cabotage appears to be the most important freedom right for enhancing trade flows, while in the direct service sub-sample fifth freedom seems to matter more. Nevertheless, when estimated with OLS (see Annex Tables 1 and 2), cabotage appears the most robust result, statistically significant with conventional OLS (direct service) and when fixed effects are controlled for (both samples). Multiple designation is also positively and statistically significantly related to merchandise trade, particularly in the direct service sub-sample. These results are less robust, though. Annex Tables 1 and 2 show that the coefficient on multiple designation is statistically significant only in the conventional OLS specification and for the full sample.

Turning to air transport capacity and pricing regulation, predetermination and Bermuda I restrictions are negatively associated with trade flows in both samples. Surprisingly, zone pricing appears to be the most important deterrent of international trade, rather than dual approval. One possible explanation is that zone pricing involves combinations of different tariff regimes and may thus entail lack of transparency for carriers. As indicated in Annex Tables 1 and 2, both results are robust to OLS estimates, particularly when fixed effects are controlled for (which are more correctly specified as potentially omitted significant variables are taken into account).

Withholding regulation and cooperative agreements are not statistically significant with the PPML estimator; they are so and with the expected sign only in one OLS specification each: withholding in the conventional OLS specification for the direct service sub-sample and cooperative arrangements in the case of fixed effects OLS for the full sample (see Annex Tables 1 and 2). The results therefore do not provide robust evidence that these measures have an impact on merchandise trade.

Table 1. The relationship between air transport regulation and merchandise trade, PPML - partner and reporter fixed effects (2005)

	Full sample						Direct service					
Log distance	-1.393***	-1.340***	-1.386***	-1.416***	-1.371***	-1.355***	-1.430***	-1.341***	-1.410***	-1.440***	-1.406***	-1.376***
	(0.0922)	(0.102)	(0.0886)	(0.0902)	(0.0994)	(0.101)	(0.0873)	(0.0976)	(0.0873)	(0.0886)	(0.0914)	(0.0949)
Language	0.157*	0.177**	0.232***	0.265***	0.166*	0.172*	0.113	0.130	0.200**	0.216**	0.119	0.128
	(0.0847)	(0.0859)	(0.0876)	(0.0880)	(0.0882)	(0.0891)	(0.0903)	(0.0902)	(0.0957)	(0.0925)	(0.0937)	(0.0957)
Historic tie	-0.216**	-0.196**	-0.184*	-0.288***	-0.201**	-0.195**	-0.200**	-0.177**	-0.161*	-0.280***	-0.187**	-0.178**
	(0.0947)	(0.0911)	(0.104)	(0.0958)	(0.0948)	(0.0955)	(0.0894)	(0.0811)	(0.0945)	(0.0911)	(0.0872)	(0.0888)
Border	0.530***	0.585***	0.537***	0.579***	0.567***	0.586***	0.362***	0.437***	0.401***	0.434***	0.405***	0.438***
	(0.130)	(0.136)	(0.137)	(0.127)	(0.137)	(0.138)	(0.120)	(0.129)	(0.137)	(0.123)	(0.130)	(0.133)
Fifth	0.133						0.184**					
	(0.0834)						(0.0892)					
Seventh	-0.129						-0.102					
	(0.123)						(0.119)					
Cabotage	0.622*						0.689					
	(0.343)						(0.451)					
Multiple designation		0.0782						0.150*				
		(0.0782)						(0.0868)				
Predetermination			-0.482***						-0.518***			
			(0.180)						(0.182)			
Bermuda 1			-0.354**						-0.361**			
			(0.171)						(0.179)			
Free determination			0.163						0.194			
			(0.156)						(0.154)			
Dual approval				0.0563						0.269		
				(0.195)						(0.218)		
Dual disapproval				-0.0385						0.158		
				(0.216)						(0.235)		
Country of origin disapproval				-0.246						1.043***		
				(0.378)						(0.288)		
Zone pricing				-0.452***						-0.445***		
				(0.132)						(0.130)		
Free pricing				0.0740						-0.191		
				(0.272)						(0.303)		
Substantial ownership and effective control					0.141						0.134	
					(0.158)						(0.171)	
Community of interest					0.199						0.335	
					(0.231)						(0.240)	
Principal place of business					0.109						0.0419	
					(0.186)						(0.191)	
Cooperative agreements						-0.00935						-0.0221
						(0.0968)						(0.0995)
Observations	724	724	724	724	724	724	454	454	454	454	454	454
Pseudo-R^2	0.965	0.964	0.966	0.966	0.965	0.964	0.968	0.968	0.970	0.970	0.968	0.967

Note: Robust standard errors reported in parenthesis. Statistical significance as follows: *** (1%), ** (5%), and * (10%).

V. Conclusions

Air freight plays an increasingly important role in the ongoing integration of Asia Pacific economies. The estimates in this study, although preliminary, find a positive and statistically significant relationship between relaxing air transport regulation and merchandise trade. Cabotage rights, capacity and tariff regulation turn out to be the most important liberalisation factors, with results robust to different specifications controlling for fixed effects. Evidence of positive correlation with trade is also found for multiple designation, although these estimates are somewhat less robust.

These initial results raise policy questions. With the reduction of tariffs and non-tariff barriers to merchandise trade in the last decades, more attention may need to be paid to diminishing transport costs. Strengthened efforts to reduce air transport restrictions under the auspices of APEC as well as other regional and multilateral fora, may provide an avenue to lower these barriers.

VI. Next steps

Further work on this working paper will include refining the methodology for estimating the impact of air transport liberalisation on merchandise trade. First, endogeneity is not as yet controlled for. The potential for reverse causality is significant here and it is envisaged to employ instrumental variables to account for this. In addition, it is assumed for now that tariffs are accounted for in the importer fixed effects, but these measures will be included in the next version of the study. Finally, cross-sectoral heterogeneity (larger effects in time-sensitive sectors) will also be accounted for.

REFERENCES

Anderson, J.E. and E. Van Wincoop (2003), "Gravity with Gravitas: A Solution to the Border Puzzle", The American Economic Review, Vol 93 No. 1**,** 170-192.

IATA (2006), "Air Freight 2006: Brighter Skies Ahead", *Economic Briefings*, February 2006.

Kasarda, J. D., J. Green and D. Sullivan (2004), "Air Cargo: Engine of Economic Development", study commissioned by the International Air Cargo Association (TIACA).

Micco, A. and T. Serebrisky (2004), "Infrastructure, Competition Regimes, and Air Transport Costs: Cross-Country Evidence", World Bank Policy Research Working Paper no. 3355, available at SSRN: http://ssrn.com/abstract=610399.

Santos, S. and S. Tenreyro (2006), "The Log of Gravity", Review of Economics and Statistics, November 2006, 88(4): 641-658.

WTO (2006), "Second Review of the Air Transport Annex: Developments in the Air Transport Sector (Part II). Quantitative Air Service Agreements Review (QUASAR) (Volumes I and II): Note by the Secretariat", document S/C/W/270.

ANNEX I. METHODOLOGY FOR ESTIMATING THE GRAVITY MODEL

The basic empirical specification of the gravity equation estimated in this study is the following:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln \text{GDP}_i + \beta_2 \ln \text{GDP}_j + \beta_3 \ln \text{distance}_{ij} + \beta_4 \text{common language}_{ij} + \beta_5 \text{common border}_{ij} + \beta_6 \text{historic tie} + \beta_7 \text{air transport regulations}_{ij} + \varepsilon_{ij}$$

i denotes reporter countries and *j* denotes partner countries; *T* represents country-pair merchandise trade and *GDP* denotes their respective GDP. *Distance*, *common language*, *common border*, *and historic tie* are geographical and historical variables commonly used in gravity regressions. *Air transport regulations* denotes the range of policy variables from the WTO QUASAR presented in Section II.

Silva and Tenereyro (2006) suggest estimating the gravity model in its multiplicative form and propose the Poisson pseudo maximum likelihood (PPML) estimation technique. This approach is useful as it provides an effective way to deal with zero values of the dependent variable and can generate more precise estimates in the presence of heteroskedasticity. The now standard gravity equation derived by Anderson and Van Wincoop (2003) introduces in the model "multilateral resistance terms", which take account of the fact that it is relative prices that matter for trade. In other words, it is not just prices in country *j* that determine exports from country *i* to *j,* but rather those prices compared with prices in all other countries. One possibility to take account of multilateral resistance is to augment the traditional gravity equation with exporter and importer fixed effects, which in its multiplicative form leads to:

$$T_{ij} = \alpha_i \, \alpha_j \, \text{EXP}\begin{pmatrix} \beta_0 + \beta_1 \ln \text{distance}_{ij} + \beta_2 \text{common language}_{ij} + \beta_3 \text{common border}_{ij} \\ + \beta_4 \text{historic tie} + \beta_5 \text{air transport regulations}_{ij} \end{pmatrix}$$

αi and αj denote reporter and partner-country fixed effects, respectively. Country-specific variables which do not vary across partner countries have to be dropped from the estimating equation as these are accounted for in the respective fixed effects.

ANNEX II. TYPES OF REGULATORY MEASURES COVERED IN THE STUDY

Trade in air transport has been heavily restricted by governments around the world since the Chicago Conference of 1944. Market access is largely determined by a complex system of some 3500 bilateral air service agreements which typically incorporate a wide range of regulatory features. The specific measures in the five features covered in this study from the WTO QUASAR are defined below.

Air freedom rights

The WTO QUASAR focuses on the following three rights:

1. **Fifth freedom.** The right to carry freight and passengers between two countries by an airline of a third country on route with origin/destination in its home country.

2. **Seventh freedom.** The right to carry freight and passengers between two countries by an airline of a third country on a route with no connection with its home country.

3. **Eight freedom or cabotage.** The right to carry freight and passengers within a country by an airline of another country on a route with origin/destination in its home country.

Designation

Broadly speaking, two possibilities are possible: single designation where each party may designate one airline, and multiple designation where each party has the right to designate one or more airlines.

Capacity

1. **Predetermination.** This clause is a prior agreement on capacity reached before operations begin, which can take the form of specified shares or of a procedure for coordination, approval and filing.

2. **Bermuda I.** This clause contains principles which airlines must respect in relation to capacity, "an *ab initio* determination of capacity by each airline acting separately". The parties to the bilateral agreement or their aviation authorities intervene only *a posteriori*, through consultation procedures.

3. **Free determination**. This clause consists of agreement by both parties not to impose unilateral restrictions on the volume of traffic, the frequency or regularity of service, or on the types of aircraft which may be used by the airlines designated by the other countries.

Pricing

1. **Dual approval.** This clause, the most restrictive, requires the approval of tariffs by the aviation authorities of the two countries before those tariffs can take effect.

2. **Dual disapproval**. This clause means that tariffs enter into force unless disapproved by the two aviation authorities.

3. **Country of origin.** Under this method, the right of disapproval can only be exercised by one of the parties when the flights in question originate in its territory.

4. **Zone pricing.** This clause involves reference points under which various types of tariff control are agreed. The parties agree to approve tariffs falling within a specified range; outside of it, one or a combination of the above may apply.

5. **No approval or free prices.** This clause stipulates that tariffs shall not be subject to the approval of any party.

Withholding

7. **Substantial ownership and effective control.** This clause, which is the most restrictive available, is referred to as a condition that substantial ownership and effective control be vested in the designating party or its nationals. Other conditions such as compliance with the laws and regulations of the grantor State may also be specified.

8. **Community of interest**. This clause is defined as being present whenever a party accepts a foreign designated airline to operate the agreed services under the condition that substantial ownership and effective control is vested: a) in countries that are parties to the agreement or by any one or more of the parties themselves, i.e. a joint operating organisation or a multinational carrier created by intergovernmental agreement; or b) in countries that are not necessarily party to the agreement but are within a predefined group with a "community of interest".

9. **Principal place of business**. This clause indicates a party's acceptance of a foreign airline if the carrier is incorporated in the designating party and its principal place of business or permanent residence is also in the designating party.

Cooperative agreements

Cooperative agreements refers to the presence of a provision for entering into cooperative marketing arrangements such as blocked-space and code-sharing.

ANNEX III. OTHER REGRESSION RESULTS

Annex Table 1. The relationship between air transport regulation and merchandise trade, OLS - partner and reporter fixed effects (2005)

	Full sample						Direct service					
Log distance	-2.030***	-2.036***	-2.035***	-2.066***	-2.039***	-2.029***	-1.956***	-1.957***	-1.933***	-1.975***	-1.938***	-1.941***
	(0.192)	(0.191)	(0.192)	(0.192)	(0.192)	(0.191)	(0.193)	(0.193)	(0.196)	(0.194)	(0.190)	(0.192)
Language	0.274**	0.255**	0.259**	0.258**	0.254**	0.265**	0.398***	0.377**	0.363**	0.378**	0.376**	0.377**
	(0.129)	(0.126)	(0.128)	(0.128)	(0.127)	(0.127)	(0.153)	(0.149)	(0.153)	(0.151)	(0.149)	(0.149)
Historic tie	0.583**	0.598**	0.607**	0.523**	0.608**	0.601**	0.348	0.360	0.353	0.220	0.359	0.351
	(0.259)	(0.253)	(0.253)	(0.266)	(0.260)	(0.258)	(0.236)	(0.230)	(0.231)	(0.241)	(0.225)	(0.231)
Border	0.505*	0.531**	0.563**	0.508*	0.494*	0.500*	0.189	0.200	0.226	0.212	0.169	0.181
	(0.263)	(0.266)	(0.268)	(0.265)	(0.263)	(0.261)	(0.242)	(0.240)	(0.251)	(0.240)	(0.238)	(0.237)
Fifth	-0.0690						-0.135					
	(0.108)						(0.117)					
Seventh	-0.129						-0.000616					
	(0.202)						(0.199)					
Cabotage	1.629***						1.960**					
	(0.620)						(0.858)					
Multiple designation		-0.141						-0.0924				
		(0.100)						(0.110)				
Predetermination			-0.353**						-0.237			
			(0.149)						(0.162)			
Bermuda 1			-0.0849						-0.0950			
			(0.154)						(0.169)			
Free determination			0.264						0.0175			
			(0.216)						(0.205)			
Dual approval				0.0835						0.319		
				(0.167)						(0.246)		
Dual disapproval				0.103						0.239		
				(0.218)						(0.282)		
Country of origin disapproval				-0.121						1.059*		
				(0.536)						(0.576)		
Zone pricing				-0.473**						-0.690***		
				(0.195)						(0.223)		
Free pricing				0.443						0.219		
				(0.489)						(0.686)		
Substantial ownership and effective control					0.188						0.280	
					(0.182)						(0.194)	
Community of interest					0.141						-0.334	
					(0.361)						(0.522)	
Principal place of business					0.0521						0.382	
					(0.304)						(0.486)	
Cooperative agreements						0.231*						0.121
						(0.122)						(0.134)
Observations	724	724	724	724	724	724	454	454	454	454	454	454
R-squared	0.900	0.900	0.901	0.900	0.900	0.900	0.918	0.916	0.917	0.918	0.916	0.916

Note: Robust standard errors reported in parenthesis. Statistical significance as follows: *** (1%), ** (5%), and * (10%).

Annex Table 2. The relationship between air transport regulation and merchandise trade, OLS (2005)

	Full sample						Direct service						
Log reporter GDP	1.457***	1.446***	1.445***	1.467***	1.436***	1.455***	1.242***	1.231***	1.239***	1.226***	1.189***	1.260***	1.231***
	(0.0700)	(0.0709)	(0.0760)	(0.0730)	(0.0732)	(0.0732)	(0.0813)	(0.0829)	(0.0881)	(0.0882)	(0.0853)	(0.0853)	(0.0829)
Log partner GDP	2.054***	2.045***	2.057***	2.058***	2.054***	2.053***	1.905***	1.900***	1.905***	1.911***	1.894***	1.905***	1.900***
	(0.0696)	(0.0693)	(0.0689)	(0.0704)	(0.0687)	(0.0691)	(0.0836)	(0.0830)	(0.0821)	(0.0849)	(0.0813)	(0.0825)	(0.0830)
Log distance	-2.227***	-2.209***	-2.206***	-2.228***	-2.213***	-2.191***	-2.013***	-1.959***	-1.969***	-1.977***	-1.988***	-1.948***	-1.959***
	(0.212)	(0.211)	(0.213)	(0.212)	(0.209)	(0.211)	(0.223)	(0.218)	(0.222)	(0.223)	(0.218)	(0.220)	(0.218)
Language	0.652***	0.628***	0.646***	0.646***	0.679***	0.661***	0.580***	0.554***	0.565***	0.551***	0.635***	0.601***	0.554***
	(0.117)	(0.120)	(0.118)	(0.118)	(0.117)	(0.117)	(0.125)	(0.127)	(0.125)	(0.124)	(0.126)	(0.124)	(0.127)
Historic tie	0.0591	0.0590	0.0604	0.0318	0.0326	0.0632	0.0434	0.0488	0.0238	0.0398	-0.00211	0.0401	0.0488
	(0.280)	(0.283)	(0.270)	(0.281)	(0.276)	(0.276)	(0.248)	(0.247)	(0.240)	(0.244)	(0.241)	(0.244)	(0.247)
Border	0.311	0.300	0.291	0.304	0.272	0.309	0.204	0.210	0.186	0.233	0.132	0.209	0.210
	(0.301)	(0.296)	(0.304)	(0.302)	(0.298)	(0.299)	(0.286)	(0.281)	(0.289)	(0.288)	(0.284)	(0.284)	(0.281)
Fifth	0.148						0.180						
	(0.112)						(0.133)						
Seventh	-0.0213						-0.0633						
	(0.245)						(0.293)						
Cabotage	0.635						0.972***						
	(0.668)						(0.352)						
Multiple designation		0.197*						0.167					
		(0.109)						(0.124)					
Predetermination			-0.417**						-0.209				
			(0.173)						(0.197)				
Bermuda 1			-0.553***						-0.445**				
			(0.192)						(0.218)				
Free determination			0.606***						0.371				
			(0.217)						(0.236)				
Dual approval				-0.102						0.0464			
				(0.250)						(0.260)			
Dual disapproval				-0.109						-0.139			
				(0.269)						(0.279)			
Country of origin disapproval				-0.815						0.148			
				(0.596)						(0.268)			
Zone pricing				-0.326						-0.231			
				(0.287)						(0.326)			
Free pricing				1.518***						0.934***			
				(0.281)						(0.289)			
Substantial ownership and effective control					-0.133						-0.0319		
					(0.245)						(0.335)		
Community of interest					-0.109						-1.006***		
					(0.427)						(0.317)		
Principal place of business					0.242						0.484*		
					(0.203)						(0.266)		
Cooperative agreements						0.0371						-0.0853	
						(0.133)						(0.146)	
Observations	698	698	698	698	698	698	444	444	444	444	444	444	444
R-squared	0.700	0.701	0.703	0.702	0.701	0.699	0.684	0.684	0.686	0.685	0.687	0.683	0.684

Note: Robust standard errors reported in parenthesis. Statistical significance as follows: *** (1%), ** (5%), and * (10%).

Annex Table 3. The relationship between air transport regulation (ALI) and merchandise trade (2005)

	OLS				OLS FE				PPML FE			
Log partner GDP	2.054***	2.054***	2.054***	2.053***								
	(0.0693)	(0.0693)	(0.0693)	(0.0693)								
Log reporter GDP	1.462***	1.462***	1.462***	1.462***								
	(0.0708)	(0.0707)	(0.0707)	(0.0707)								
Log distance	-2.188***	-2.189***	-2.187***	-2.189***	-2.044***	-2.046***	-2.044***	-2.044***	-1.351***	-1.358***	-1.350***	-1.345***
	(0.211)	(0.211)	(0.211)	(0.211)	(0.194)	(0.194)	(0.194)	(0.194)	(0.0976)	(0.0970)	(0.0977)	(0.0984)
Language	0.666***	0.665***	0.669***	0.664***	0.256**	0.256**	0.256**	0.256**	0.185**	0.183**	0.186**	0.185**
	(0.119)	(0.118)	(0.119)	(0.119)	(0.127)	(0.127)	(0.127)	(0.127)	(0.0823)	(0.0824)	(0.0823)	(0.0823)
Historic tie	0.0610	0.0615	0.0592	0.0621	0.599**	0.599**	0.599**	0.599**	-0.168*	-0.172*	-0.168*	-0.167*
	(0.276)	(0.276)	(0.275)	(0.276)	(0.260)	(0.260)	(0.260)	(0.260)	(0.0915)	(0.0921)	(0.0915)	(0.0909)
Border	0.309	0.311	0.305	0.312	0.504*	0.504*	0.504*	0.504*	0.592***	0.587***	0.593***	0.594***
	(0.296)	(0.296)	(0.295)	(0.296)	(0.263)	(0.263)	(0.263)	(0.263)	(0.129)	(0.129)	(0.129)	(0.130)
Log ALI	-0.000928				0.0202				0.0740**			
	(0.0456)				(0.0407)				(0.0298)			
Log ALI 5th		0.000945				0.0202				0.0701**		
		(0.0440)				(0.0388)				(0.0285)		
Log ALI own			-0.00758				0.0195				0.0756**	
			(0.0460)				(0.0414)				(0.0303)	
Log ALI des				0.00341				0.0180				0.0709**
				(0.0451)				(0.0399)				(0.0289)
Observations	698	698	698	698	724	724	724	724	724	724	724	724
R-squared	0.699	0.699	0.699	0.699	0.900	0.900	0.900	0.900				
Pseudo-R^2									0.965	0.965	0.965	0.965

Note: Robust standard errors reported in parenthesis. Statistical significance as follows: *** (1%), ** (5%), and * (10%). ALI 5th indicates more weight to fifth freedom; ALI own indicates more weight to withholding; and ALI des indicates more weight to multiple designation. All ALI variables are converted into logarithms after adding 0.0001, in order to retain observations for which the indicators equal zero.