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Economic Consequences of the ASEAN-China Air Transport Agreement

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ASEAN has been liberalizing its internal aviation market through the Roadmap for Integration of Air Travel Service Sector (RIATS) and the Implementation Framework of the ASAM as an integral part of the ASEAN Economic Community (AEC). In addition, ASEAN has been working to liberalize extra-regional aviation markets through the air transport agreements with its Dialog Partners such as China, Japan, Korea and India. In this regard, China has been the only partner with whom ASEAN already concluded the agreement.

The objective of this study is to empirically investigate the impacts of the ASEAN-China Air Transport Agreement (ACATA) by relating the detailed flight data and the information on the institutional aspects of the agreement, after controlling for a standard set of explanatory variables in the gravity models, namely the gross regional domestic products (GRDP) of the regions where departing and arriving airports locate and the distance between the airports. Applying the Poisson pseudo-maximum likelihood (PPML) method, the Heckman sample selection method, and a panel probit model, we confirmed that the ACATA indeed had positive impacts on the capacity of air cargo transportation between China and ASEAN, particularly in terms of opening new routes (extensive margin) instead of expanding existing routes (intensive margin).

We have investigated the impacts of the ACATA on the capacity of air cargo transportation between China and ASEAN, by estimating a gravity model using Poisson pseudo-maximum likelihood (PPML) method, the Heckman Sample Selection Model (HSSM), and a panel probit model.

The results from the PPML methods show that the entry into force of the protocols 1 and 2 of the ACATA had significantly positive impacts on the air cargo capacity of the relevant routes (Table 1). The result of the Heckman Sample Selection Model needs to be interpreted carefully because the Wald Test failed to reject the inapplicability of the model (Table 2). However, the result may imply that the ACATA, both protocols 1 and 2, had significant positive impacts on the opening of the new route but it has not contributed in the subsequent increase in the air cargo capacity. Indeed this point was confirmed through the subsequent panel probit estimation of the selection equation (Table 3). In other words, the entry into force of the ACATA did not have significant impacts on the route those already existed at that time. The definition and the sources of the data are provided in Table 4.

There is no common rule of thumb to decide which of the PPML and the HSSM is desirable. However it is necessary for us to investigate further why the latter cannot be applied to our gravity model given that the PPML estimation seemed to work very well. Another direction of future research would be to confirm the causal relationship from the air cargo capacity to airborne trade using the routes. Also, we can extend our study to the passenger transportation, starting from investigating whether the ACATA increased the number of seats in the flights connecting China and ASEAN. The next step of this line study would be to examine the causal relationship from the number of seats to the number of tourists. All these future study requires extensive efforts to construct a reliable dataset.

Table 1. PPML Estimators

Depvar:	*ftons*	(1)	(2)	(3)	(4)	(5)
ln_dep_grdp	Coef.	0.0716	0.0796	0.0247	0.0689	0.0324
	Robust S.E.	0.0160	0.0165	0.0165	0.0168	0.0167
	z	4.4600	4.8300	1.4900	4.0900	1.9400
	P>z	0.0000 ***	0.0000 ***	0.1350	0.0000 ***	0.0520 *
ln_arr_grdp	Coef.	0.0969	0.1046	0.0432	0.0845	0.0460
	Robust S.E.	0.0174	0.0175	0.0169	0.0176	0.0172
	z	5.5900	5.9600	2.5600	4.8000	2.6800
	P>z	0.0000 ***	0.0000 ***	0.0110 **	0.0000 ***	0.0070 ***
ln_gcd	Coef.		-0.2550	-0.2199	-0.1647	-0.1603
	Robust S.E.		0.0814	0.0828	0.0828	0.0832
	z		-3.1300	-2.6500	-1.9900	-1.9300
	P>z		0.0020 ***	0.0080 ***	0.0470 **	0.0540 *
acatap1	Coef.			0.7774		0.6016
	Robust S.E.			0.0461		0.0485
	z			16.8500		12.4000
	P>z			0.0000 ***		0.0000 ***
acatap2	Coef.				1.0021	0.6606
	Robust S.E.				0.0408	0.0454
	z				24.5800	14.5600
	P>z				0.0000 ***	0.0000 ***
_cons	Coef.	3.1457	5.0550	4.3085	4.2118	3.8383
	Robust S.E.	0.1328	0.6119	0.6290	0.6273	0.6361
	z	23.6900	8.2600	6.8500	6.7100	6.0300
	P>z	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***
	Number of obs	14,892	14,892	14,892	14,892	14,892
	Wald chi2	34.04	41.09	307.91	642.05	582.61
	Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
	Log pseudolikelihood	-1,669,713	-1,664,402	-1,527,068	-1,542,327	-1,478,340
	Number of iteration	1	1	2	3	3
	Pseudo R2	0.0081	0.0113	0.0929	0.0838	0.1218

Source: Authors.

Note: ***, **, and * denote statistical significance of 1%, 5%, and 10% respectively.

Table 2. Heckman Sample Selection Model Estimators

Number of obs	14,892	Wald chi2(3)	2.63
Selected	3,287	Prob > chi2	0.45
Nonselected	11,605	Log pseudolikelihood	-12,513

	Coef.	Robust S.E.	z	P>z	[95% Conf. Interval]	
(1) The gravity equation: Depvar = *ln_ftons*						
ln_dep_grdp	-0.020	0.014	-1.520	0.130	-0.047	0.006
ln_arr_grdp	-0.013	0.014	-0.960	0.338	-0.040	0.014
ln_gcd	-0.024	0.055	-0.430	0.666	-0.132	0.085
_cons	4.908	0.434	11.310	0.000	4.058	5.759
(2) Selection equation						
ln_dep_grdp	0.024	0.006	3.800	0.000	0.012	0.036
ln_arr_grdp	0.030	0.007	4.500	0.000	0.017	0.042
ln_gcd	-0.065	0.028	-2.290	0.022	-0.121	-0.009
acatap1	0.420	0.016	26.610	0.000	0.389	0.451
acatap2	0.842	0.034	24.750	0.000	0.776	0.909
rg_landlocked	0.059	0.020	2.960	0.003	0.020	0.099
_cons	-1.188	0.220	-5.400	0.000	-1.619	-0.756
atanh ρ	-0.070	0.036	-1.940	0.053	-0.142	0.001
ln σ	0.408	0.013	31.200	0.000	0.383	0.434
Rho (ρ)	-0.070	0.036			-0.141	0.001
Sigma (σ)	1.504	0.020			1.466	1.543
Lambda (λ)	-0.106	0.055			-0.213	0.001
Wald test for the independency of equations (H_0: ρ=0)					chi2(1)=	3.75
					Prob > chi2	0.0527

Source: Authors.

Table 3. Panel Probit Estimators

Depvar:	*d_ftons*	(1)	(2)	(3)	(4)	(5)
ln_dep_grdp	Coef.	0.2454	0.0553	0.2359	0.0748	0.0631
	S.E.	0.0281	0.0211	0.0290	0.0254	0.0133
	z	8.7300	2.6200	8.1400	2.9400	4.7600
	P>z	0.0000 ***	0.0090 ***	0.0000 ***	0.0030 ***	0.0000 ***
ln_arr_grdp	Coef.	0.1233	0.0595	0.1074	0.0569	0.0706
	S.E.	0.0200	0.0188	0.0238	0.0227	0.0137
	z	6.1800	3.1700	4.5200	2.5100	5.1600
	P>z	0.0000 ***	0.0020 ***	0.0000 ***	0.0120 **	0.0000 ***
ln_gcd	Coef.	-0.1354	-0.1551	-0.0139	-0.0532	-0.0718
	S.E.	0.0694	0.0707	0.0887	0.0861	0.0580
	z	-1.9500	-2.1900	-0.1600	-0.6200	-1.2400
	P>z	0.0510 *	0.0280 **	0.8750	0.5370	0.2160
acatap1	Coef.		0.7681		0.5687	0.5703
	S.E.		0.0281		0.0310	0.0217
	z		27.3200		18.3200	26.2900
	P>z		0.0000 ***		0.0000 ***	0.0000 ***
acatap2	Coef.			1.7043	1.3107	1.2646
	S.E.			0.0597	0.0602	0.0416
	z			28.5400	21.7900	30.3700
	P>z			0.0000 ***	0.0000 ***	0.0000 ***
_cons	Coef.	-1.7132	-1.1101	-2.9977	-2.1241	-1.9201
	S.E.	0.5720	0.5699	0.7263	0.6959	0.4499
	z	-3.0000	-1.9500	-4.1300	-3.0500	-4.2700
	P>z	0.0030 ***	0.0510 *	0.0000 ***	0.0020 ***	0.0000 ***
/lnsig2u	Coef.	-0.8622	-0.8645	-0.2849	-0.3759	-0.4223
	S.E.	0.1374	0.0976	0.1109	0.0963	0.0680
sigma_u	Coef.	0.6498	0.6490	0.8672	0.8287	0.8097
	S.E.	0.0446	0.0317	0.0481	0.0399	0.0275
rho	Coef.	0.2969	0.2964	0.4293	0.4071	0.3960
	S.E.	0.0287	0.0204	0.0272	0.0233	0.0163
	Number of obs	7,489	7,489	7,489	7,489	14,892
	Number of groups	686	686	686	686	1,373
	Wald chi2	100.21	849.62	839.63	1,093.56	2,207.80
	Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
	Log likelihood	-3,710	-3,230	-3,111	-2,924	-5,898
	LR test of *rho* =0: chibar2(01)	322.13	449.07	593.63	638.37	1,237.63
	Prob >= chibar2	0.000	0.0000	0.0000	0.0000	0.0000

Source: Authors.

Note: ***, **, and * denote statistical significance of 1%, 5%, and 10% respectively. Different from the Table 4, *rg_landlocked* variable was removed here because it was not significant in all specifications.

Table 4. List of variables

Variable	Unit	Definition	Source and description
fton	ton	Capacity of aircargo in terms of freight tons between departing and arriving airports.	OAG Database
gcd	km	Global circular distance between departing and arriving airports.	OAG Database
gdp	USD MIL	Gross domestic product at current price in US dollar.	IMF, World Economic Outlook, October 2019.
dep_grdps arr_grdps	[0-1]	Share of gross regional domestic product (grdp) of the region where the airport in located in GDP.	Authors' computation based on the official statistics of each country, such as National Bureau of Statistics(NBS), China; Badan Pusat Statistik (BPS-Statistics), Indonesia; Department of Statistics (DOS), Malaysia; Philippines Statistics Authority (PSA), Philippines; National Economic and Social Development Board (NESDB), Thailand; and General Statistical Office (GSO), Vietnam. For Singapore and Brunei, grdps is set to 1. For Cambodia, Laos, and Myanmar, the baseline estimate using the IDE-GSM in Kumagai and Umezaki (forthcoming) is used.
dep_grdp arr_grdp	USD MIL	= [gdp] * [grdps]	
landlocked	[0, 1]	Dummy to represent whether the country is landlocked or not.	Authors.
landlocked_rg	[0, 1]	Dummy to represent whether the region, where the airport is located, is landlocked or not.	Authors.
acatap1	[0-2]	= [dep_acatap1_eif] + [arr_acatap1_eif]	Authors' compultation based on “ASEAN Transport Instruments and Status of Ratification as of 26 December 2019” posted on the website of the ASEAN Secretariat (https://asean.org/storage/2017/05/IoR-matrix-Air-Transport-Instruments.pdf), accessed on 4 February 2020. For the year of entry into force, the variable is set between 0 and 1 based on the information of the date of entry into force.
acatap2	[0-2]	= [dep_acatap2_eif] + [arr_acatap2_eif]	
d_dep_acatap1_eif	[0-1]	Dummy variable to represent whether Protocol 1 of the ACATA has entered into force in departing country.	
d_arr_acatap1_eif	[0-1]	Dummy variable to representwhether Protocol 1 of the ACATA has entered into force in arriving country.	
d_dep_acatap2_eif	[0-1]	Dummy variable to represent whether Protocol 2 of the ACATA has entered into force in departing country.	
d_arr_acatap2_eif	[0-1]	Dummy variable to represent whether Protocol 2 of the ACATA has entered into force in arriving country.	
d_dep_acatap2_dap	[0, 1]	Dummy variable to represent the status of the departing airport whether it is listed designated airports	Authors' compilation based on Protocol 2 of the ACATA. Designated airports are "10 named points in ASEAN", "10 named points in China", or "28 named points in China," in Protocol 2 of the ACATA.
d_arr_acatap2_dap	[0, 1]	Dummy variable to represent the status of the arriving airport whether it is listed designated airports.	