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Dynamic relationship between air transport, economic growth and inbound tourism in Cambodia, Laos, Myanmar and Vietnam

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Abstract

Cambodia, Laos, Myanmar and Vietnam (the CLMV countries) in Mainland Southeast Asia share a similar history in their political systems, development of their aviation industries and their economic development in general. This study examines the relationship between air transport development, economic growth and inbound tourism in the CLMV countries. There is bi-directional causality between air passenger traffic and economic growth in the long run. Inbound tourism has a significant impact on air transport demand in the long run but no significant relationship exists between the two in the short run. Air transport deregulation had a positive and significant impact on traffic volumes, particularly for Cambodia. Further reforms are still needed before such an outcome can occur in Myanmar.

Keywords: Air transport, tourism, economic growth, deregulation, autoregressive distributed lag

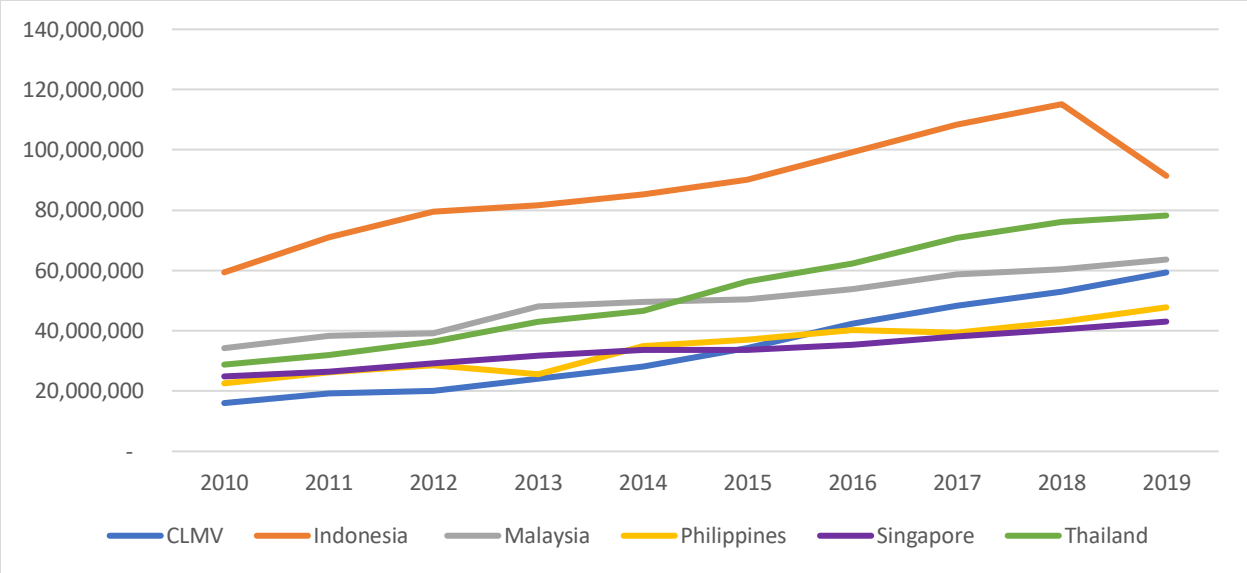
1. Introduction

Improving transport connectivity is one of the major elements to increasing economic growth in a country (Zhu et al., 2019). The development of civil air transport connectivity contributes to a country's economic growth through creating jobs, promoting trade, and stimulating tourism. Air transport plays a particularly important social and economic role particularly in remote areas (International Transport Forum, 2018, Zhang et al., 2017). Its development will help countries to diversify their economies and lead to increased and sustainable growth (IATA, 2019). The open market policy adopted by Cambodia, Laos, Myanmar and Vietnam (the CLMV countries) over the last two decades has facilitated the development of their aviation industries and attracted foreign and private investment. However, due to a lack of expertise and infrastructure, their aviation industries are lagging in comparison with other countries in the Asia-Pacific region (Asian Development Bank, 2017). Although it is acknowledged that the CLMV countries have substantial potential for growth in air passenger travel through tourism and trade (Rahman, Khatri and Brunner, 2012).

There is a large body of literature on the relationship between economic development and air transport demand: Baltaci, Yıldız and İpek (2015) on Turkey; Secilmis and Koc (2016) on Turkey and European Union; Abed, Abdullah and Jasimuddin (2001) on Saudi Arabia; Witt and Martin (1987) on Germany and United Kingdom; Carmona-Benítez, Nieto and Miranda (2017) on Mexico; Brida, Bukstein and Zapata-Aguirre (2016) on Italy; Hakim and Merkert (2019) on South Asia; and Todorova and Haralampiev (2020) on Bulgaria. However, none of these investigations have covered the CLMV countries. Air transport also supports international tourism. In particular, air transport policy and the presence of low-cost carriers can significantly increase international arrivals to tourism destinations (Zhang and Findlay 2014; Zhang, 2015; Alderighi and Gaggero, 2019). For a long time, the aviation industries in the CLMV countries were at a disadvantage when compared with their higher income Association of Southeast Asian Nations (ASEAN) neighbours like Singapore, Malaysia, Thailand etc (Rahman, Khatri and Brunner, 2012). In recent years, the total air traffic carried by the airlines of these four countries remained lower than that of Indonesia, Thailand and Malaysia, but has caught up with that of Singapore and the Philippines, as shown in Figure 1. The governments of the CLMV countries have realised the importance of an aviation industry to their economic development. In 2003 they

established the CLMV Sub-regional Cooperation on Air Transport Group to promote people and freight movements between each other (Tan, 2013).

Figure 1: Air passenger traffic (in persons) in CLMV, Indonesia, Malaysia, Singapore, Thailand and the Philippines



The CLMV countries share a similar overall history, as well as aviation industry development and economic development. However, little attention has been paid to the development of CLMV countries' air transport sector and its contribution to their economies. The literature documenting air transport development of a group of countries which share similar economic developments is particularly rare. This paper aims to close the research gap by examining the short and long-term relationships between economic growth, inbound tourism and air transport demand in the CLMV countries. The next section will briefly introduce the economic development of these countries, followed by a review of relevant studies. Section 4 presents the methodology and data. Section 5 showcases the results and discussion. The last section concludes the study.

2. Economic development in the CLMV countries

Historically, the CLMV countries were colonised by Western powers: Myanmar formed part of British India from 1824 to 1948, and Cambodia, Laos and Vietnam were part of French Indochina from 1887 to 1954 (Nair, 2016). The CLMV countries also shared a similar economic structure in which agriculture was the key industry and human capital development especially through education and training was lacking (Rillo and Sombilla, 2015). The cost of labour in the CLMV countries is relatively low compared with other countries in the Asia-Pacific region (Mathai et al., 2016). Post-independence, the CLMV countries were isolated from the rest of the world for a long period of time due to their repressive, communist governments (Banomyong and Ishida, 2010). They have all benefited from political liberalisation and rapid economic growth over the past three decades. Air connectivity for the CLMV countries was established in the 1980s after economic reforms were undertaken (Rahman, Khatri and Brunner, 2012). Table 1 shows the timeline of major events in the CLMV countries since the 1800s. The four countries have shared a similar trend toward economic reform leading to regional integration and subsequently air deregulation.

Table 1: Timeline of events of the CLMV countries from the 1800s to the 2000s.

	Colonisation Era	Independ-ence year	Internal Conflict Period	Closed-Door Policy	Economic Reform	ASEAN Member	Air Deregulation
Cambodia	1893-1953[1]	1953	1970-1975	1975-1989	1989	1999	2010
Laos	1893-1953[1]	1953	1959-1975	1975-1986	1986	1997	2009
Myanmar	1824-1948[2]	1948	1962-1988	1962-2010	2010	1997	2012
Vietnam	1824-1954[1]	1954	1955-1975	1975-1994[3]	1986	1995	2006

Remark: [1] French Indochina, [2] British Burma, [3] Trade embargo

Source: Compiled by authors

In 2019, the population of the CLMV countries was 174 million which accounted for approximate 25% of ASEAN member population and 3.6% of the total population of Asia. The gross domestic product (GDP) per capita in 2019 was an average of US$2,200 which is much lower than the ASEAN average of US$12,979 and Asia's average of US$17,909 (World Bank, 2020).

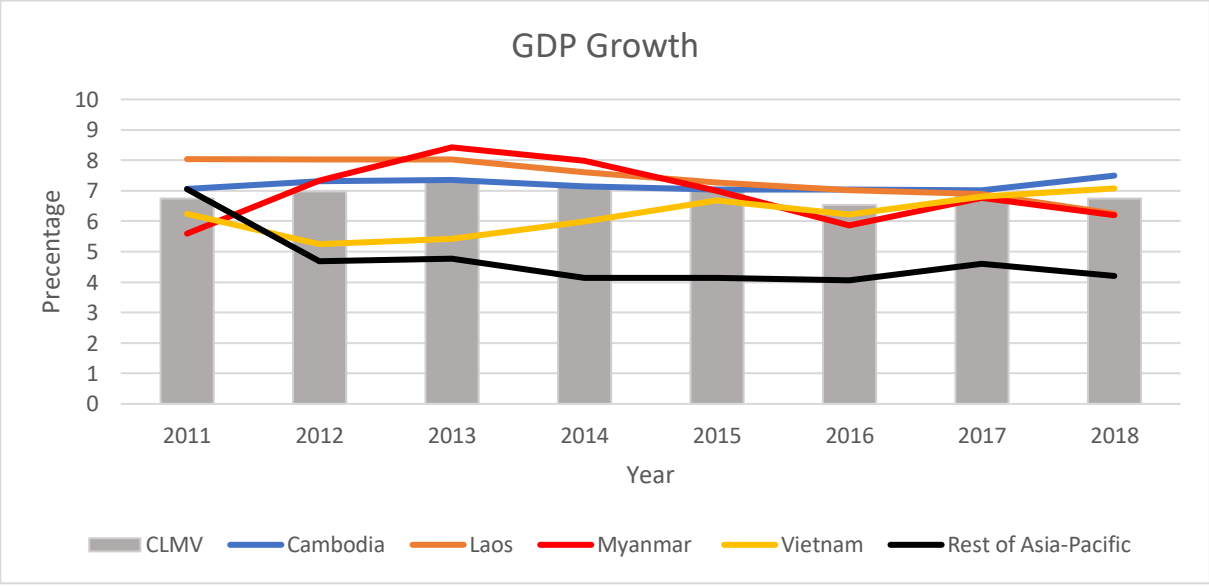
The CLMV countries form the fastest growing economic sub-region of the ASEAN region. Their economic growth rates have outpaced all countries in Asia except China over the past 10 years. Among the poorest countries in the Asia-Pacific, the CLMV countries have in recent decades become more attractive to many foreign investors (The Economist, 2018). Of the four countries in 2019, Vietnam had the highest GDP, followed by Myanmar, Cambodia and Laos (Table 2). The GDP data in Figure 2 shows substantial economic growth in the CLMV countries over the last two decades. In 2015, Cyclone Komen hit Myanmar, and the resulting flooding seriously damaged most parts of the country and affected its neighbours (Macgregor, 2015). This has slowed the economic growth of the CLMV countries and Myanmar has suffered the most.

Table 2: GDP of the CLMV countries in 2019

Rank	**1**	**2**	**3**	**4**
Country	Vietnam	Myanmar	Cambodia	Laos
GDP (US$)	261.92 billion	76.08 billion	27.09 billion	18.17 billion
Population	96,462,106	54,045,420	16,486,542	7,169,455

Source: World Bank (2020)

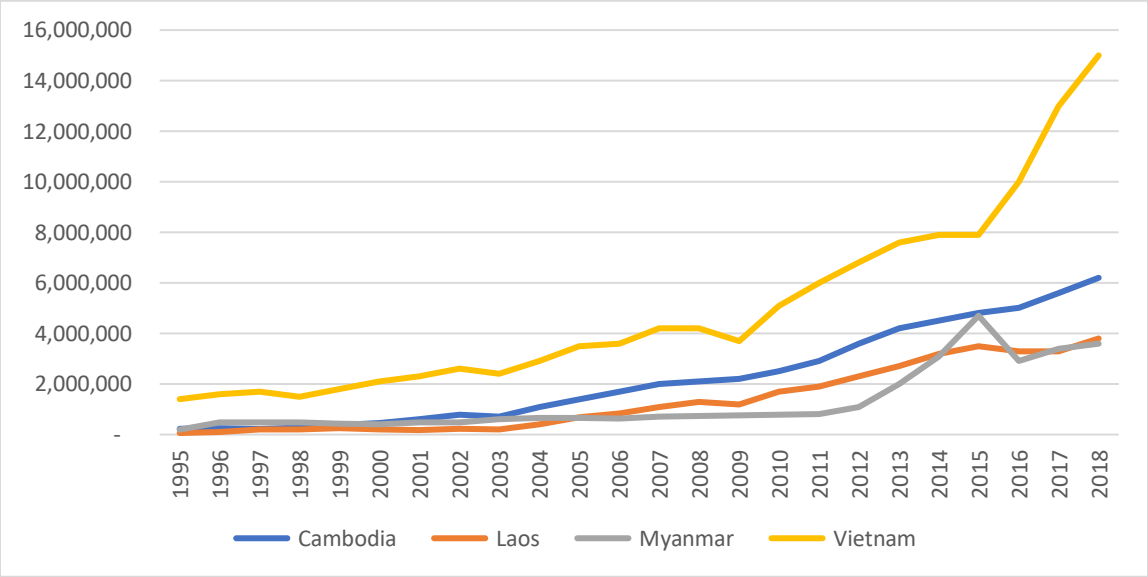
Figure 2: GDP growth rates of the CLMV countries.



Source: World Bank.

With rich natural and cultural attractions, the CLMV countries have become favourable tourism destinations for international tourists, particularly after 2008, as shown in Figure 3. Vietnam led the growth, followed by Laos. According to the Asian Development Bank (2016), international tourist arrivals increased by 167% from 8.2 million in 2008 to 22 million in 2016. The annual increase rate was twice that of neighbouring countries. The tourist arrivals into CLMV countries now contribute 19% of ASEAN total tourist arrivals, which makes tourism one of the key economic drivers for the CLMV region (ASEAN, 2018).

Figure 3: International arrivals to CLMV



Source: World Bank

Economic reforms in the CLMV countries over the past three decades have led to the rapid development of their civil aviation industries. Air transport deregulation has also been a major contributor to such development. One of the greatest events in the airline industry worldwide was the passage in the USA of the Airline Deregulation Act (ADA) in 1978 (Zhang and Round, 2008). Other countries followed suit in the following two decades and relaxed controls over fares, routes, services, ownership and entry (Zhang et al., 2017; Wang et al., 2018; Law et al., 2018). Zhang and Findlay (2014) argued that among all the reforms in air transport policy, relaxing ownership control was central to expansion. Once ownership control had been loosened, government interference is commonly reduced and further liberalisation measures would be

expected to follow, including allowing multiple designations and granting flying rights on international routes to private carriers. The events marking the deregulation in airline ownership in CLMV include:

- In 2006, the government of Vietnam amended the Civil Aviation Law and allowed private entities and foreign investors to own and operate air transport services in Vietnam (ICAO, 2013).
- In 2009, the Lao government introduced a new Investment Promotion Law. The Law allowed private companies or foreign companies to commence airlines in Laos with up to 100% ownership (Asia Briefing, 2019).
- In 2010, the Cambodian government lifted foreign ownership restrictions and allowed foreign entities to operate airlines in the country (Tan, 2017).
- Myanmar passed the Foreign Investment Law in 2012 after the new civil government was elected. Under the new law, domestic and international air transport services can be conducted via joint ventures with local private entities or government agencies (British Chamber of Commerce, 2017).

These reforms have contributed to the significant growth in the number of flights and travellers, and the amount of cargo carried in recent times. Registered air carrier departures in the CLMV countries rose from 65,700 in 1970 to 372,743 in 2018. The number of air travellers increased from 1.9 million in 1970 to more than 53 million in 2018. Of the 53 million, Vietnam accounted for more than 47 million (88.57%), Myanmar 3.4 million (6.42%), Cambodia (1.4 million (2.66%) and Laos 1.3 million (2.36%) (World Bank, 2019). During the same period, air cargo traffic increased from 7.4 million tonnes to more than 488 million tonnes in 2018. Vietnam accounted for more than 481 million tonnes (98.58%), Myanmar for 4.74 million tonnes (0.97%), Laos for 1.53 million tonnes (0.31%) and Laos for 0.67 million tonnes (0.14%) (World Bank, 2019). The locations of the main airports in this region are shown in Figure 4 and the number of passengers handled at each airport is presented in Table 3. All the airports have experienced substantial growth in passenger numbers since 2008.

Figure 4: Major international airports in the CLMV region.

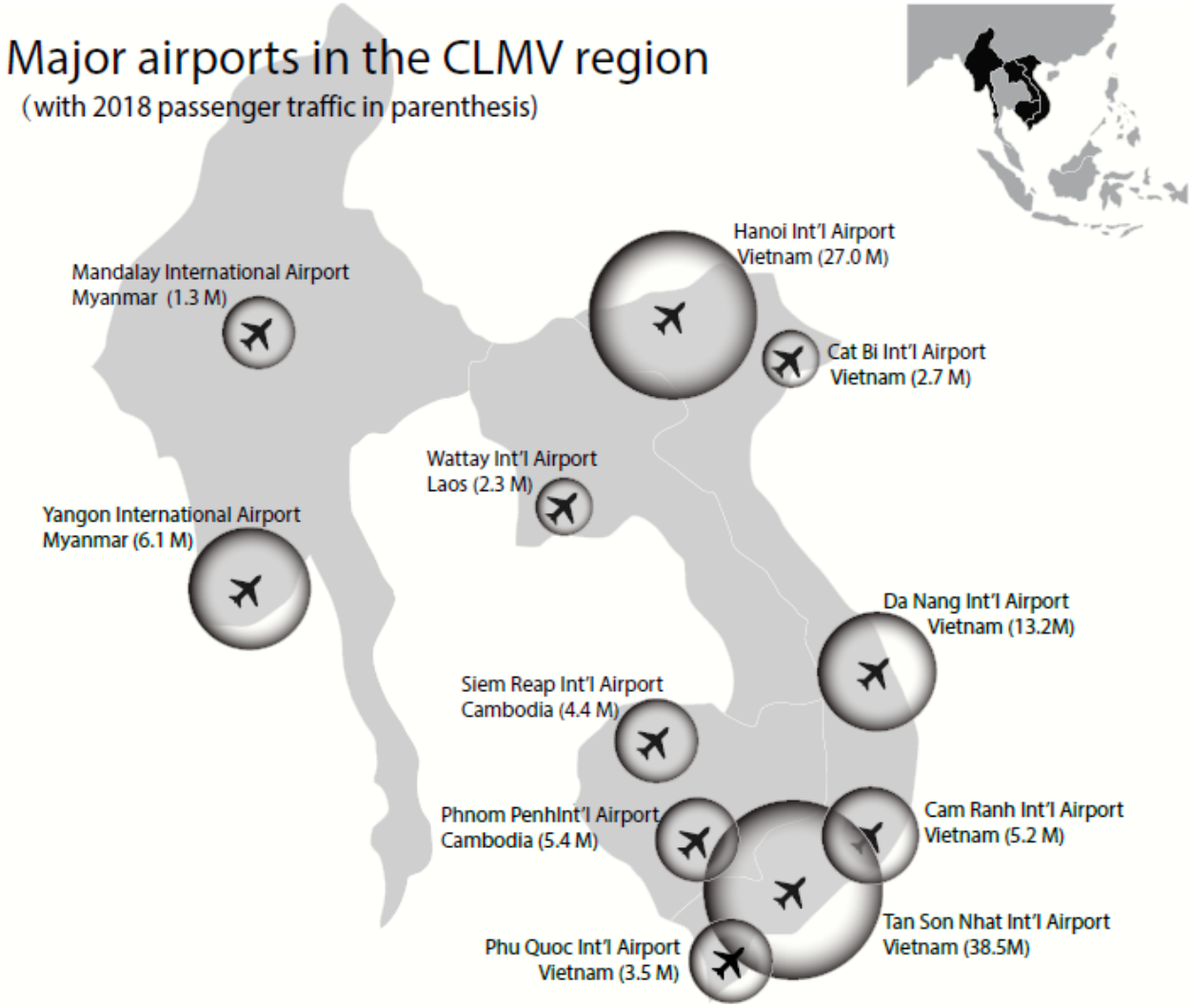


Table 3: Air passenger traffic at major airports in CLMV

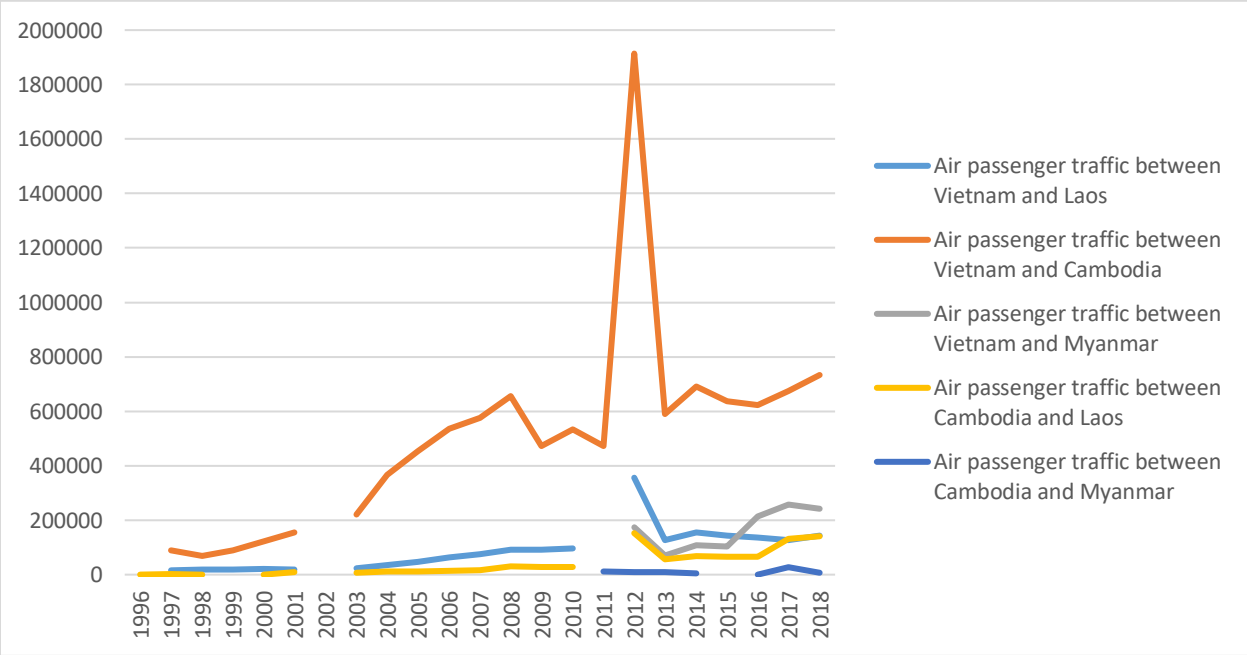
Year	Cambodia		Laos	Myanmar		Vietnam			
	Phnom Penh	Siem Reap	Wattay	Mandalay	Yangon	Cam Ranh	Da Nang	Hanoi	Tan Son Naht
2009	1.5	1.3	0.6	0.3	1.6	0.7	2.1	7.7	12.8

2012	2.1	2.2	0.8	0.6	3.1	1.1	3.1	11.3	17.6
2014	2.7	3.0	1	0.9	1.4	2.1	5	14.2	22.1
2016	3.4	3.5	1.1	1.1	5.5	4.9	8.8	20.6	32.5
2018	5.4	4.4	2.3	1.3	6.1	5.2	13.2	27	38.5

Source: CAPA

Figure 5 present the air passenger traffic flows within the CLMV countries, while figure 6 gives the air passenger traffic between Vietnam, Cambodia, Laos, Myanmar and other ASEAN countries.[1] Both figures show that the 2008 global financial crisis caused a slowdown in air passenger traffic in the subsequent years, followed by a surge in passenger traffic in 2012. The traffic between the four countries remained relatively stable in from 2013 to 2018 while the traffic between each CLMV country and other ASEAN partners increased substantially in this period.

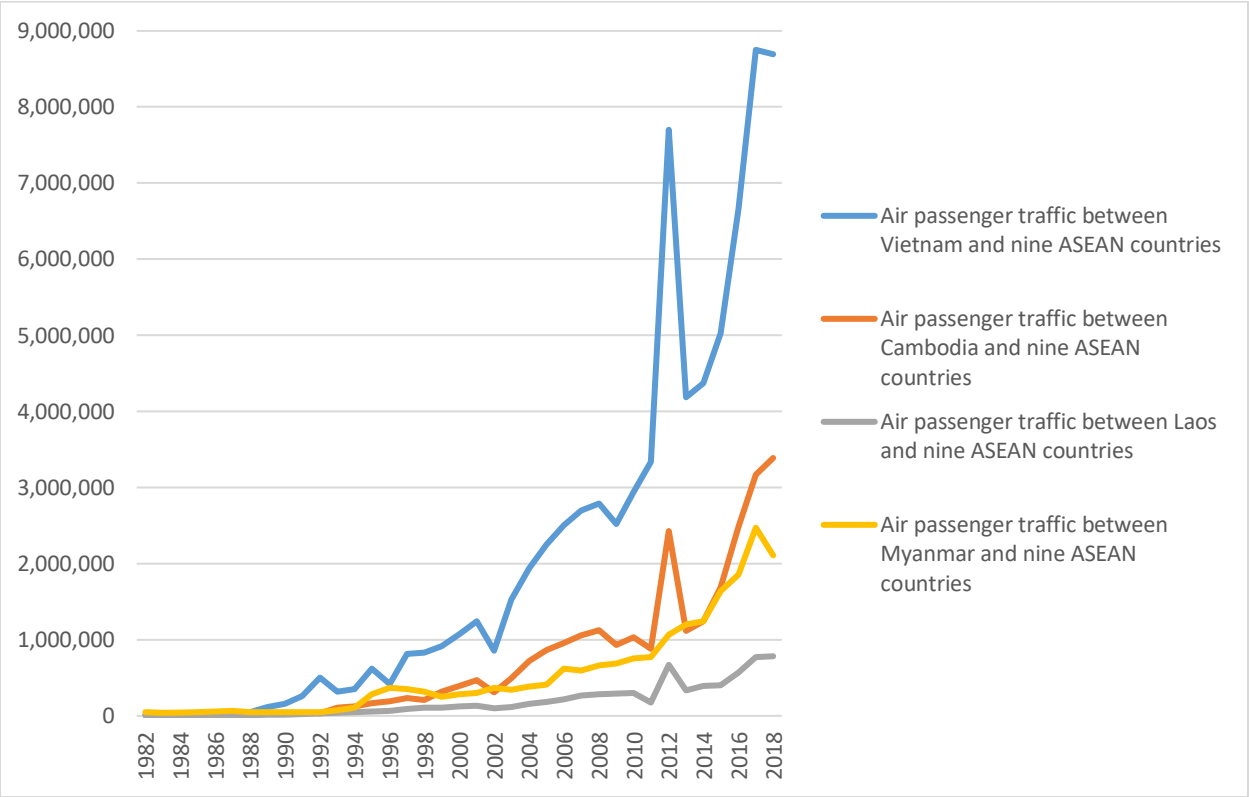
Figure 5: Air passenger traffic between Vietnam, Cambodia, Laos and Myanmar



Source: ICAO

[1] The lines in Figure 5 are broken because there are data missing for some periods.

Figure 6: Air passenger traffic between Vietnam, Cambodia, Laos, Myanmar and other ASEAN countries



Source: ICAO

3. Literature Review

Economic growth drives the development of air transport industry (Fu, Oum and Zhang, 2010; Hakim and Merkert, 2016; Gong et al., 2018), such as the launch of new airlines serving passenger and freight markets and an increase in connectivity between destinations.[2] These changes promote travel and trade which in return contribute to economic growth (COMCEC, 2014; ATAG, 2017; Zhu et al., 2019). Increased disposable incomes enable more people to travel and increase demand for passenger and cargo shipments, which generate revenues for airlines enabling them to expand and improve their services. More air travel also brings additional revenue to governments through the taxes and levies collected on tickets, which can be used to

[2] Some researchers argue that the desire or the promise of economic development, rather than the development itself, is the main driver leading to air transport development (Zhang and Graham, 2020).

improve existing aviation facilities and to establish new ones (IATA, 2011). With the intertwined relationship between air transport and a country's economic growth, analysing air transport demand allows the aviation industry to make sound investment decisions and governments to design appropriate policies to produce good economic outcomes for the country.[3]

The majority of past empirical studies have estimated that income and population are the key determinants of air travel demand (Jacobson, 1978; Calderón, 1997; Ba-Fail, Abed and Jasimuddin, 2000; Abed, Abdullah and Jasimuddin, 2001; Hofer, Windle and Martin, 2008; Zhang and Round, 2009; Marazzo, Rafael Scherre and Fernandes, 2010; Kopsch, 2012). Valdes (2015) and Suryani, Chou and Chen (2012) included foreign direct investment data in their studies because that variable and exports are closely related. Foreign direct investment can stimulate exports which in turn create air freight demand. A study by Castelli and Walter (2003) divided the drivers of air travel demand into five major factors: activity (population, GDP per capita), location (distance, tourist market, intra-model competition, inter-model competition), quality of service (aircraft size, frequency of flights), market (hub strategy, year, period of observation) and price (airfare). Hakim and Merkert (2019) included GDP per capita, foreign direct investment, industrialisation, flight frequency, urban population growth and the jet fuel price when analysing air travel demand in some south Asian countries.

Air transport deregulation has been a key driver of the increase in air travel including leisure travel (Zhang and Round, 2008; Wang et al., 2018). Warnock-Smith and O'Connell (2011) note that air traffic and consequently incoming tourism expenditure could be at least be partially stimulated through changes in aviation policy. Wu et al. (2020) found that air transport deregulation is one of the key factors influencing China's low-cost carrier (LCC) network development, which has significant implication for tourism development in regional areas. Researchers have found a mutual dependence relationship between air transport and tourism (Forsyth, 2008; Papatheodorou, 2021): airlines often participate in a tourist destination planning and development and tourism companies frequently invest in airlines and airports to make a tourist destination more accessible (Spasojevic et al., 2018). For example, a recent study by

[3]Zhang and Graham (2020) report that a bi-directional causal relationship seems to have been confirmed in less developed economies. The effects of economic growth on air transport remain unclear in developed aviation markets.

Madurapperuma and Higgoda (2020) confirms the existence of a bidirectional causal relationship between tourism and air transport in Sri Lanka.

Air transport is attractive to travellers mainly for its speed and comfort. Travelling to some remote locations by surface-based transport requires longer travel times which can make the journey less pleasant and reduce relaxation time. Increases in the number of tourists allows airlines to increase its capacity on an existing route and to expand its network to more destinations (UNWTO, 2015; Wu et al, 2020). It also attracts new airlines to enter the market. The economy benefits when new air services stimulate travel and trade, which can assist in spreading wealth across countries as well as within a nation, particularly benefiting those living in geographically isolated areas (Zhang, 2015). The additional direct and indirect economic opportunities supporting the aviation industry can also increase employment (ATAG, 2017). Interestingly, Lee and Change (2008) report that tourism development has a greater impact on economic development in non-OECD countries than in OECD countries. Sokhanvar et al. (2018) further pointed out that the direction of the causal relationship between tourism and economic growth is country dependent. The inconsistency in the nexuses between air transport, tourism and economic growth reported in previous studies motivated us to conduct a case study to revisit this issue in the under-developed CLMV countries.

There are a few studies related to the context of air transport demand in Asia: Hakim and Merkert (2016; 2019), Karim, Ieda and Alam (2000), and Abed, Abdullah and Jasimuddin (2001). The study of air travel demand in middle-income countries by Valdes (2015) included Malaysia and Thailand. Hakim and Merkert (2019) found that income, foreign direct investment, flight frequency and the jet fuel price are highly correlated to air passenger demand in south Asian countries. Karim, Ieda and Alam (2000) indicated that exports and imports, income growth and foreign remittances are correlated to air passenger demand and that air freight demand is influenced by exports, imports and urban population size. Abed, Abdullah and Jasimuddin (2001) identified population size and total expenditure as the main determinants of international air travel in Saudi Arabia. The findings of Bastola (2017) indicated that GDP and the number of tourists arriving were strong indicators when projecting air passenger demand in Nepal.

4. Methodology

Antunes and Martini (2020) note that regression analysis and Granger-causality analysis are two commonly used approaches to studying the impact of air transport on regional development. In recent years, the panel autoregressive distributed lag (ARDL) dynamic framework developed by Pesaran and Smith (1999) and Pesaran et al. (2001) has gained its popularity in examining the long-run and short-run relationships between air transport and economic variables (e.g., Stamolampros and Korfiatis, 2019; Shafique et al., 2021). This paper uses the ARDL model to examine the relationship between air transport demand, economic growth, and international inbound tourist expenditure. The analysis incorporates a consideration of the impact of air transport deregulation in the CLMV countries. The ARDL framework integrates the short run and long run effects with an error correction model (ECM). The coefficient of the ECM reflects the speed of adjustment at which the model converges to the long-run equilibrium. A negative and significant coefficient of the error correction term suggests that there is a long-run stable relationship between the relevant variables. This implies that pretesting of integration is not required. That is, the long run relationship between variables can be tested without the need to know whether they are I(0) or I(1) as long as the dependent variable is constrained to be I(1). However, none of the variables should be integrated at I(2). Therefore, the unit root test is still needed to ensure they only follow an I(1) or I(0) process or a mix of the two. The ARDL framework can also accommodate the endogeneity problem by the inclusion of the lagged values of both endogenous and exogenous variables. The ARDL approach is particularly suitable for small samples like is found in this study (Haug, 2002).

Following Pesaran et al. (1999), the general ARDL (k p q) model including the long run relationship between variables is specified as follows.[4]

$$\Delta lnPAX_{i,t} = \alpha_i + \sum_k \phi_{1k}\Delta lnPAX_{i,t-k} + \sum_p \phi_{2p}\Delta lnGROWTH_{i,t-p} + \sum_q \phi_{3q}\Delta lnTOUR_{i,t-q+} \delta DER +$$

$$\theta_1 lnPAX_{i,t-1} + \theta_2 lnGROWTH_{i,t-1} + \theta_3 lnTOUR_i + \mu_{i,t-1} \qquad (1)$$

[4] Following most empirical studies using ARDL model such as Greene (2008), the logarithmic form is used to reduce the skewness of the original data and also make it easier to interpret the results.

where *k*, *p*, and *q* denote the optimal lag length variable following the commonly used Akaike information criterion (AIC), Schwartz information criterion (SIC) and Hannan-Quinn criterion (HQ); Δ is the first difference operator; α_i is country-specific intercepts, and $\mu_{i,t-1}$ indicates the error correction term. θ is the speed of adjustment *i*. Included are: travel demand or air passenger traffic (*PAX*), economic growth rate (*GROWTH*), inbound tourist expenditure (*TOUR*) and an air transport deregulation dummy in the model. The data span a period of 24 years from 1995 to 2018. Passenger traffic is the sum of domestic and international passengers carried in country *i* in year *t*. The GDP growth rate is the percentage change in real GDP (2010 constant dollar term) for country *i* in year *t*. Tourist expenditures include payments to national carriers for international transport, and any other prepayment made for goods or services received in country *i* in year *t*. The data of these three variables come from the World Bank database. The deregulation dummy denotes the time period during which significant reforms in a country's air transport sector occurred.

As the variables of economic growth and tourist expenditures are likely to be endogenous, the ARDL models are written using each of the two as the dependent variable similar to Equation (1) and the other variables as independent variables. This will allow determination of the impacts of travel demand on economic growth and tourist expenditures, respectively.

If there is long-run relationship between the variables, the ARDL model can be written in the ECM form by grouping the variables by levels in Equation (1):

$$\Delta lnPAX_{it} = \alpha_i + \sum_k \phi_{1k}\Delta lnPAX_{i,t-k} + \sum_p \phi_{2k}\Delta lnGROWTH_{i,t-p} + \sum_q \phi_{3q}\Delta lnTOUR_{i,t-q+} \delta DER + \theta ECT_{i-1} + \mu_{it} \qquad (2)$$

where ECT_{i-1} is the error correction term. A negative and significant coefficient θ (speed of adjustment) denotes how fast a deviation from the long-run equilibrium is eliminated following changes in each variable. In the same fashion, the ECM form equations can be written for GROWTH and TOUR when they are each treated as dependent variables.

Pesaran et al., (1997, 1999) presents two approaches to estimate non-stationary dynamic panels with the assumption that the parameters are heterogeneous across groups: the mean-group (MG) and pooled mean-group (PMG) estimators. PMG assumes that the long-run coefficients are equal across panels while the short-run effects are allowed to differ across groups. The MG estimator allows for heterogeneity of all the parameters. A Hausman test can be used to decide whether MG or PMG should be used. If the parameters are homogenous, the PMG estimates are more efficient than MG (Pesaran et al., 1999).

5. Results and Discussion

Table 4 provides more information about the variables used in the estimation procedure.

Table 4: The descriptive statistics

Variable	Obs.	Mean	SD	Min	max
PAX	96	3,648,615	8,370,663	112,500	47,000,000
GDP rate	96	0.077	0.024	0.001	0.138
TOUR (US$ in million)	88	1,640	2,310	5,200	10,100
DEG	88	0.385	0.489	0	1

Panel unit root tests were first used to check the stationary properties of the dataset. There are multiple panel unit root tests available, including but not limited to the Dickey-Fuller test (Dickey and Fuller, 1979), the Phillips-Perron test (Phillips and Perron, 1988), the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test (Kwiatkowski et al., 1992), the Zivot–Andrews test (Zivot and Andrews, 1992), and the Im, Pesaran and Shin test (Im, Pesaran and Shin, 2003). The CLMV countries are heterogeneous between each other (Das, 2013), therefore the Im, Pesaran and Shin (IPS) test was applied in this study.

Table 5: The panel unit root test (IPS).

Variables	Deterministic	The IPS test	
		Level	**First difference**
lnPAX	Individual intercept	3.0113	-5.1994***
	Individual intercept and Trend	-0.3036	-4.7118***
lnGROWTH	Individual intercept	-2.4212***	-6.2480***
	Individual intercept and Trend	-1.2342	-5.5864***
lnTOUR	Individual intercept	0.9538	-2.9877***
	Individual intercept and Trend	0.6887	-2.5814***

Note: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

The results of the unit root test in Table 5 suggest that all the variables are stationary when the first differences are taken. Next is the estimation of the ARDL model but first the optimal lag length needs to be selected. AIC suggests an ARDL (2 2 2) model while BIC and HQ prefer ARDL (1 1 1). Considering the small sample size, the ARDL (1 1 1) model was adopted. Table 6 reports the results of MG and PM with the dependent variable being lnPAX. The choice between MG and PMG estimation also depends on the Hausman test which has a chi-square statistic value of ($\chi^2(2)=2.3$). The null hypothesis can thus be rejected at 1%, implying the acceptance of the long run homogeneity assumption. Therefore, the PMG estimation is more consistent than the MG estimation and thus is reported in this paper.

Table 6 Panel ARDL model results (dependent variable: lnPAX)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long Run Equation				
lnGROWTH	0.252648	0.116585	2.167070	0.0338
lnTOUR	0.301358	0.114998	2.620541	0.0109
Short Run Equation				
ECT	-0.222536	0.060288	-3.691197	0.0005
D(lnGROWTH)	0.193781	0.122127	1.586723	0.1174
D(lnTOUR)	0.056323	0.107283	0.524990	0.6013
DEG	0.272173	0.105132	2.588859	0.0118
C	1.739437	0.316868	5.489472	0.0000

Mean dependent var	0.114656	S.D. dependent var	0.220952
S.E. of regression	0.195264	Akaike info criterion	-0.517987
Sum squared resid	2.516446	Schwarz criterion	0.101347
Log likelihood	44.79143	Hannan-Quinn criter.	-0.268473

The results in table 6 show that there are statistically significant long-run relationships between economic growth, tourist expenditures, and travel demand. In particular, a 1% increase in GDP growth rate would lead to a 0.25% increase in air passenger traffic. A 1% increase in tourist expenditures results in an increase in air passenger traffic by 0.3%. The negative and significance of the error correction terms suggests that there are significant long-run relationships between economic growth and tourist expenditures and travel demand. The convergence speed value is between 0 and -1, which implies that a deviation from the long-run equilibrium can be restored with an adjustment period of about 4.5 years (1/0.22). Interestingly, the short-run effects of economic growth and tourist expenditures on passenger traffic are not statistically significant. Air transport deregulation has a significant and positive impact on travel demand as expected. On average, deregulation contributes to an increase of 27% in air passenger traffic, which is considered substantial in magnitude.

To better understand the impact of economic growth tourism on travel demand at a country level, Table 7 reports the short-run effects of these variables using the PMG procedure. For all the countries except Myanmar, air transport deregulation has a significant impact on the level of traffic flow. This is not surprising as Myanmar was the last country of the four to open its aviation sector to private and foreign investors. The effect of deregulation is more pronounced in Cambodia as the liberalisation move led to an increase in travel demand of almost 53%. Compared with other CLMV nations, Cambodia has a reputation as one of the easiest markets to obtain air operator's certificates for new airlines. To attract external capital to support the development of the aviation industry, the Cambodian government have eased the foreign airline ownership restrictions and allowed foreign carriers to establish and operate businesses in the country (Asian Development Bank 2014; CAPA, 2014; Dennis, 2018). Therefore, it is not surprising to see that the deregulation impact is larger in Cambodia than in other countries.

Table 7 Short-run country specific results (PMG)

	ECT(-1)	D(lnGROWTH)	D(lnTOUR)	DEG
Cambodia	-0.384***	-0.049	-0.231	0.528***
Laos	-0.245***	0.486***	0.258*	0.326***
Myanmar	-0.141	0.395	0.173	0.026
Vietnam	-0.120***	0.298	0.025	0.210***

Tables 8 and 9 report the ARDL model results when economic growth and tourist expenditure are used as dependent variables, respectively. Table 8 shows the evidence of a positive relationship between passenger traffic and economic growth in both the short term and long term. However, inbound tourist spending and deregulation have no significant impact on economic growth. Sak and Karymshakov (2012) report that there is bidirectional causality between tourism and economic growth in Europe, and one-way causality from GDP to tourism in America, and Latin America. A unidirectional causal relationship exits from tourism to GDP in East Asia, South Asia and Oceania. In some regions such as Middle East and North Africa, there is no causal relationship between these two variables. Therefore, it appears that the relationship is really country or region-dependent. It also suggests that tourism development may have not generated strong multiplier effects on economic growth in CLMV.

The results from Table 9 suggests that air travel demand, and economic growth have no significant impact on inbound tourist spending levels. This finding is not consistent with those reported in other studies. For example, Küçükönal and Sedefoğlu (2017) claim that there is a short run causal relationship running from tourism to air transport in OECD countries. Madurapperuma and Higgoda (2020) report a bidirectional causality between tourism development and air passenger movements in the short run. Balli et al. (2019) show that in general, international inbound tourists have a causal relationship with airline economy seat capacity for most countries, but for some countries, this relationship is weak or does not exist when exports or imports are included. In this study it is possible that in the short run, many tourists may enter the CLMV via surface transport modes from China and Thailand, which can break down the link between tourism and air transport.

From Tables 7, 8 and 9 the causality flows between these variables can be inferred. There is bidirectional long-run causality between air travel demand and economic growth in both the short run and long run as well as uni-directional causality running from inbound tourism to passenger traffic in the long run, but not the other way around.

Finally, one limitation of this study is the relatively small-time dimension of the data used. The CLMV countries only gained political stability in the late 1980s or early 1990s, which means that a large sample to include other relevant variables of interest was not possible.

Table 8 Panel ARDL model results (dependent variable: lnGROWTH)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long Run Equation				
lnPAX	0.196038	0.077155	2.540829	0.0134
lnTOUR	-0.130382	0.104628	-1.246147	0.2171
Short Run Equation				
ECT(-1)	-0.601605	0.113845	-5.284398	0.0000
D(lnPAX)	0.525563	0.251847	2.086837	0.0408
D(lnTOUR)	0.244955	0.345841	0.708287	0.4813
DEG	-0.055128	0.062490	-0.882191	0.3809
C	-1.720024	0.381153	-4.512688	0.0000

Table 9 Panel ARDL model results (dependent variable: lnTOUR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long Run Equation				
lnGROWTH	-0.772843	0.483717	-1.597719	0.1149
lnPAX	-0.360505	0.231908	-1.554520	0.1248
Short Run Equation				
ECT(-1)	-0.151471	0.128604	-1.177814	0.2431
D(lnPAX)	-0.209474	0.201868	-1.037680	0.3032
D(lnGROWTH)	0.291633	0.147385	1.978713	0.0520
DEG	0.318587	0.378195	0.842387	0.4026
C	3.464085	2.741822	1.263424	0.2109

6. Conclusions

Because of their past political environments the civil air transportation industries in Cambodia, Laos, Myanmar and Vietnam were delayed in their development when compared with other countries in the Asia-Pacific region. This study examined the short and long-run relationships between economic growth, air transport demand and inbound tourism in these countries who share similar economic development characteristics including their aviation activities. The findings of this study confirm the existence of bi-directional causality between air transport development and economic growth. Inbound tourism has a significant impact on air travel demand in the long run but there is not a significant relationship in the short run. Air transport deregulation has had a positive and significant impact on traffic volumes, particularly in Cambodia. However, significant effects of deregulation in Myanmar have not been observed.

It is apparent that air transport is a very important contributor to the economic growth of a country. Investment in air transport infrastructure must keep pace with a country's economic development for sustainable growth to occur. This includes investment in both air traffic management and airport facilities to increase capacity and improve aviation safety, as well as investment in innovative technologies to enhance passenger experiences. These investments will allow major airports in the region to enhance connectivity and build connecting hubs, which consumers value and which further benefit the economy.

It is clear that further liberalisation in air transport can boost travel demand, which in turn can stimulate economic growth. Air transport policies in CLMV are still relatively restrictive. In fact, many of the national carriers in this region are under full/majority ownership of government, which results in an uneven playing field among airlines. Further relaxation of the airline ownership restrictions can increase competition and thereby improve airline efficiency. Removing foreign ownership restrictions also reduces the opportunities of subsiding national airlines, which will free up government funds for more socially productive uses.

Covid-19 has caused great disruptions to air transport and tourism. The International Air Transport Association indicates that the global passenger traffic (measured by revenue passenger kilometres) declined by 66% from 2019 to 2020 (IATA, 2021). Global tourism also suffered a huge decline in international travellers in 2020. Researchers such as Papatheodorou (2021) have called for a comprehensive revival program for the air transport and tourism sector involving airlines, airports and tourism destination authorities. This study suggests that once the long run equilibrium is disrupted, it could take more than four years to restore the long-run steady state, which is a rather long time. The CLMV region can consider taking action to accelerate the adjustment speed such as pursuing uniform standards and regulations in air transport and advancing the ASEAN single aviation market to support the resumption of international travel in the post-pandemic era.

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