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Deregulation of the ASEAN air transport market: measure of impacts of airport activities on local economies

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Abstract

ASEAN Member States are currently in a step through liberalization of air traffic market in their region. The target is the 5th freedom right for South-East Asia in 2020. Two opposite effects might be observed following the deregulation: one negative on flag carrier due to increase in competition, one positive on national and regional economies. One main issue concerns the impact of expected development of airport activity on national and regional economies. We propose an estimation of these impact, using a two stage econometric model applied to four ASEAN countries. We show that GDP is the most sensible to air traffic growth in region where only international airports are located, that is for region that exhibit the highest level of development. We show that up to the 5th freedom right, given the expectation in tourism development, national GDP is expected to increase by 9% (Myanmar) to 51% (The Philippines) depending on the country. The magnitude of the impact depends on the tourism development expectation as well as on the tourism contribution to GDP. The analysis show then that economic benefit of air transport liberalization are non-negligible for the ASEAN countries. Given the magnitude of the estimated effect, the benefits would certainly overlap the negative effect of competition on the flag carriers.

Keywords: air trafic, economic impact, liberalization, econometrics, ASEAN

1. Introduction

Historically air transport in South East Asia† is regulated on the basis of bilateral agreements which impose restrictions in operations in the region for non-ASEAN as well as ASEAN airlines. ASEAN Member States have decided to sign agreements which define the milestones for liberalization of air transport in the region. The idea of liberalizing the air travel sector came as early as 1995 in the ASEAN leaders' summit held in Bangkok. In 2004, the 10th air transport ministers' meeting in Phnom Penh decided upon an "Action Plan for ASEAN Air Transport Integration and Liberalization 2005–2015" (ASEAN, 2004). The objective was to establish a single aviation market by 2015.

While not all of the countries have reached the same level of ratification, they however have all made steps towards greater liberalization. The first target was to open 5th freedom right‡ for the ASEAN region in 2015. Air transport liberalization up to the 5th freedom right, also named ASAM (ASEAN Single Aviation Market), will remove the frequency and capacity constraints existing in bilateral air service agreements between Member States. It will simplify and foster the mobility of ASEAN citizens inside the area.

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† South Eastern Asian countries are: Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.

‡ 5th freedom right (sometimes referred to as beyond rights): the right for an airline to take passengers from its home country, deposit them at the destination and then pick up and carry passengers on to other international destinations. *Source: www.boeing.com*

Air transport liberalization leads to highest air traffic volumes. In the Current Market outlook produced by Boeing in 2014, it is argued that following the Japan-Taïwan Open Skies agreements, the number of destinations has double between these two countries on the two years period August 2011 and August 2013. In a deregulated environment, airlines have to adapt their strategies in response to highest competition. They have the freedom to vary fares, to develop their networks. Deregulation is a recognized driver of traffic and network growth.

As a consequence of ASEAN deregulation, air traffic is then expected to increase meanwhile national carriers might be armed by stronger competition. Some of the Member States unwillingness to ratify the preliminary steps through liberalization might be due to this fear of competition for their flag carriers. According to Alan Tan Khee Jin (2013), some national airlines are afraid of increased competition in their markets, and have persuaded their governments to adopt a protectionist stance. In this context ASEAN member States face a tradeoff between the potential positive impact on the economy following air traffic increase and potential negative consequences on their flag carriers. One main issue for ASEAN Member States is therefore to be able to evaluate the potential impacts that the liberalization of air transport up to the 5th freedom right may have on their economy at national and regional levels. If this impact appears to be highly positive it might compensate the adverse effect supported by the national carriers and then encourage the States to accept more easily the different steps through liberalization.

The relationship between economic growth and air transport development has been addressed in numerous reports or in the economic literature. Teresa Cederholm (2014) argues that globally and "*according to the World Travel and Tourism Council (or WTTC), the travel and tourism industry's total contribution to the global economy rose to $6,990 billion, or 9.5% of the GDP (gross domestic product), and is expected to grow by 4.3% to $7,289 billion, or 9.6% of the GDP, in 2014*"[§]. Similarly, the relationship between tourism activities and air traffic demand is recognized. On one side tourism is a driver for air traffic, on the other side, when the share of tourists arriving by air is negligible, as this is the case within the ASEAN region, the causality is reversed. The magnitude of this impacts depend on characteristics of the country at stake in particular in terms of economic development and tourists travel habits.

ASEAN countries face different economic conditions as well as different level of development of the air transport activity. However, so far a few studies have analyzed and estimated the economic impacts of the air transport market liberalization for the ASEAN countries. The ECORYS (2012) study focuses on the economic impacts for Indonesia, Myanmar and the Philippines between 2015 and 2030. This study however only estimates part of the impacts due to ASAM (ASEAN Single Aviation Market): only economic impacts due to air traffic increase between ASEAN member states (and not with non-ASEAN member states) are addressed. Other studies have focused on the impacts of the air transport liberalization at a worldwide level such as thec one producd by InterVISTAS-ga (2006). These studies however weren not able to provide reliable results, for developing countries such as ASEAN member states, due to missing data.

The method used in the InterVISTAS-ga (2006) study can be broken down in two steps. First, an econometric model is built and estimated to forecast air traffic between any two countries (or group of countries). This model is based on economic variables characteristics, trade level, geographic relationships and air service agreements characteristics. A general least square method using the GDP variable as a weighting factor is estimated. Then, the model is used to estimate incremental traffic from liberalization by changig the dummy variable "Air Service Agreement" from 0 to 1. Once these forecasts obtained, multiplier coefficients got from the ATAG (2004) study are applied on forecasted traffic levels to estimate the corresponding impacts, on GDP, employment, etc. A similar method is also applied in the ECORYS (2012) study. Such method however presents three main drawbacks.

The first drawback is related to the missing modelling of the interdependent relationships between economic and air transport activities. So far, only few authors have studied this simultaneity issue because of the need to have panel datasets for a long period of time. Using data for Brazil from 1996 to 2006, Marazzo et al. (Marazzo, Scherre, & Fernandes, 2010) show that GDP and air passenger traffic are co-integrated variables. Co-integration means that both data series present stationary linear combinations. In other words, co-integration also means that there is a long-run equilibrium linking both data series and generating a kind of coordinated movement over time. Evidence of such a long-run equilibrium relationship between economic growth and air passenger traffic is also shown by Hu,

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[§] ***http://marketrealist.com/2014/12/impact-travel-tourism-industry-economy/***

Xiao, Deng, Xiao, and Shouyang (2015) on the Chinese domestic market between 2006 and 2012. Testing for co-integration requires first showing that both data series are non-stationary and then checking the linear combination between variables *i.e.* the existence of a long-term relationship. Both papers show the importance of taking into-account the double-causality between air passenger traffic and GDP when forecasting air traffic.

The second drawback in the method applied in the ECORYS (2012) or in InterVISTAS-ga (2006), is the use of multiplier coefficients between forecasted air transport growth and economic indicators to estimate the economic impact of the obtained traffic forecasts. These multipliers provided by the ATAG (2004) study are average multipliers for five areas of the world (North America, Europe, Latin America, Asia-Pacific, Middle East and Africa). All these regions include countries with different air traffic and economic levels and features. Applying these average multiplier coefficients at a country level, fails to take into account the countries' heterogeneity and leads to under or over-estimation of the economic impact of the air transport activity at regional level.

Finally in these studies, the economic impacts do not estimate the regional impacts of ASAM for each of the considered country due to airport activity.

We aim to fill these gaps by providing an econometric model which controls for the double-causality between air passenger traffic and GDP. We propose a method to estimate regional and national economic impacts of air transport liberalization up to the 5th freedom rights in ASEAN countries. We restrict the analysis to 4 among the 10 ASEAN countries: Lao PDR, Myanmar, the Philipines, and Vietnam.

The impacts are estimated locally/regionally on the basis of traffic to and from the airports of city/region. Two complementary economic impacts are estimated: the current sensitivity of local/regional GDP to airport traffic growth; the potential impacts of air transport liberalization on GDP up to 2020. The methodology to reach these objectives is developped on the basis of:

1. the observed current situation of the countries: air transport market and socioeconomic indiators,
2. the expected future evolutions: developpement of air transport markets in terms of traffic or socioeconomic development.

Section 2 describes the main characteristis of the countries in the scope of the analysis. The full methodology is explained in section 3. Section 4 presents the data used for the estimation. Finally, the results are presented in section 5.

2. Characteristics of the ASEAN countries

2.1. Lao PDR

Lao PDR is a small country, with 6.4 million inhabitants. Its GDP is the lowest in the ASEAN region, with a GDP amounting only to 0.37% of the ASEAN GDP. However, the Lao PDR economy is quite dynamic, with an annual GDP increase of 7.95% during the period 2004-2013 (Source: World Bank). Natural resources (forestry, agricultural land, hydropower, and minerals) represent more than half of the total wealth.

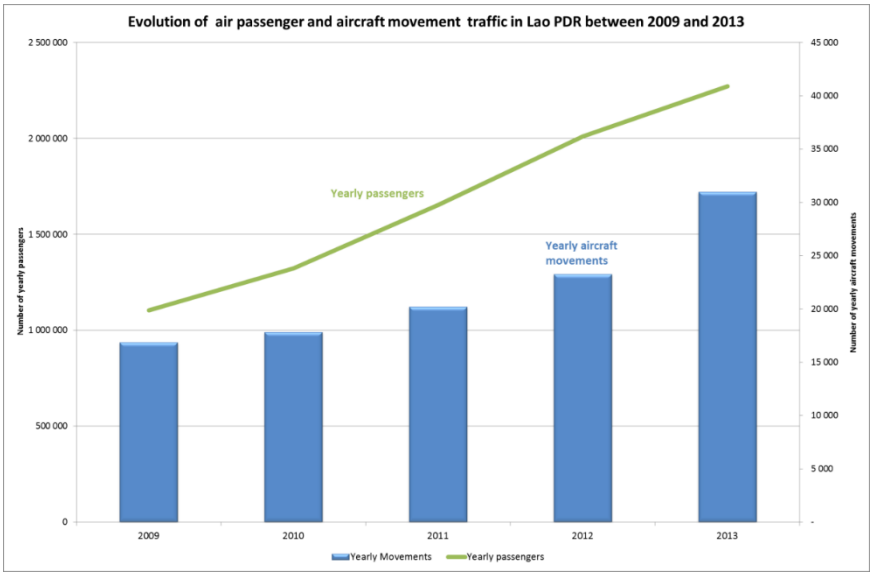

Fig.1. Evolution of air passenger and aircraft movement traffic in Lao PDR between 2009 and 2013 (Source: Lao PDR Civil Aviation)

In the recent years, the development of these resources drives the GDP rate of growth. Lao PDR welcomed 3.8 million tourists in 2013 (Source: Lao PDR Ministry of Tourism) which represents around 4% of the total tourists of the ASEAN region. The number of tourists in the country is increasing constantly with average growth reaching 17%per year between 2005 and 2013.

Air traffic in Lao PDR is rather low and only represents 1% of the total passenger traffic in ASEAN in 2013 (Source: World Bank). The yearly traffic increase is however quite high with an average of 20% between 2009 and 2013 (Source Lao PDR Civil Aviation). Currently only two Laotian airports handle international traffic: Vientiane and Luang Prabang airports.

2.2. Myanmar

Myanmar is the largest country (mainland) of Southeast Asia with 676 577 km² and 60 million inhabitants, but represents only 2.43% of the total ASEAN GDP. Myanmar is however on a growing path with a yearly GDP increase of 7.3% between 2012 and 2013 (Source: World Bank). There are currently few tourists visiting the country but their number has grown by 93% between 2012 and 2013 to reach 2 million tourists. Due to this very strong increase, the yearly average rate of growth (between 2004 and 2013) in tourist numbers in the country is 18% (source: Myanmar Ministry of tourism).

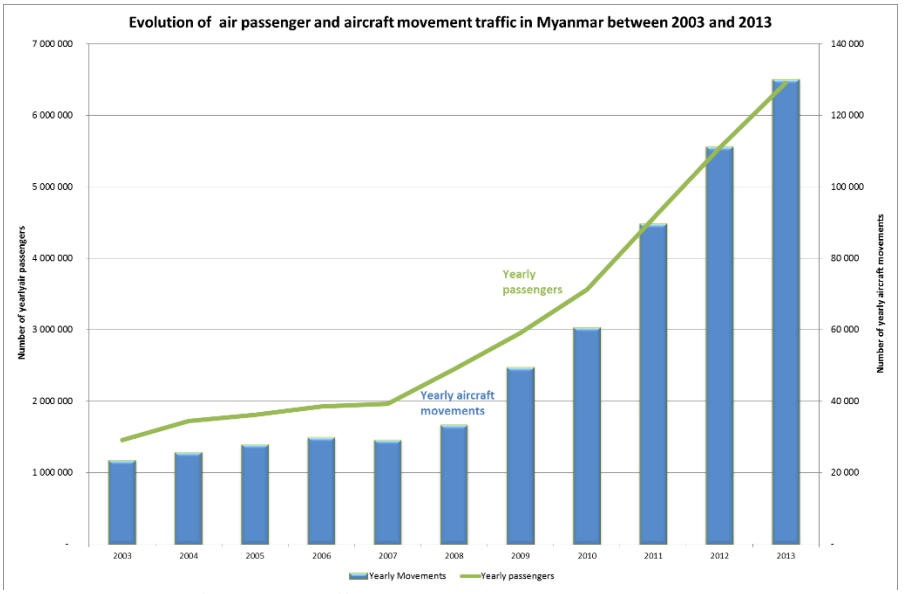

Fig.2. Evolution of air passenger and aircraft movement traffic in Myanmar between 2003 and 2013 (Source: Myanmar Civil Aviation)

As for Lao PDR, the air traffic is low in Myanmar and only represents 1% of the total ASEAN passenger traffic in 2013 (Source: World Bank). The air traffic has nevertheless increased considerably (+229%) between 2007 and 2013. Three airports operate international traffic: Yangon International Airport, Mandalay International Airport and Nay Pyi Taw International Airport.

2.3. The Philippines

The Philippines have the second largest population in the ASEAN, after Indonesia, with 95 million inhabitants. Its GDP represents 10.8% of the total GDP in the area. GDP growth in the Philippines averaged 5.2% per year between 2004 and 2013 (source: World Bank). The Philippines welcomed 4.7 million tourists in 2013 (Source: Philippines Statistics Authority) which represents around 5% of the total tourists in the ASEAN region. While 2009 saw a slight decline in the number of tourists, the average tourist rate of growth reaches 8% per year between 2005 and 2013; this is equivalent to the average rate of growth in the ASEAN region.

The air traffic operated to and from Philippines airports represents 10% of the total ASEAN passenger traffic in 2013 (Source: World Bank). The average yearly traffic growth between 2004 and 2013 is 10%. International air traffic is organized to and from Manila airport while eleven airports are able to receive international traffic.

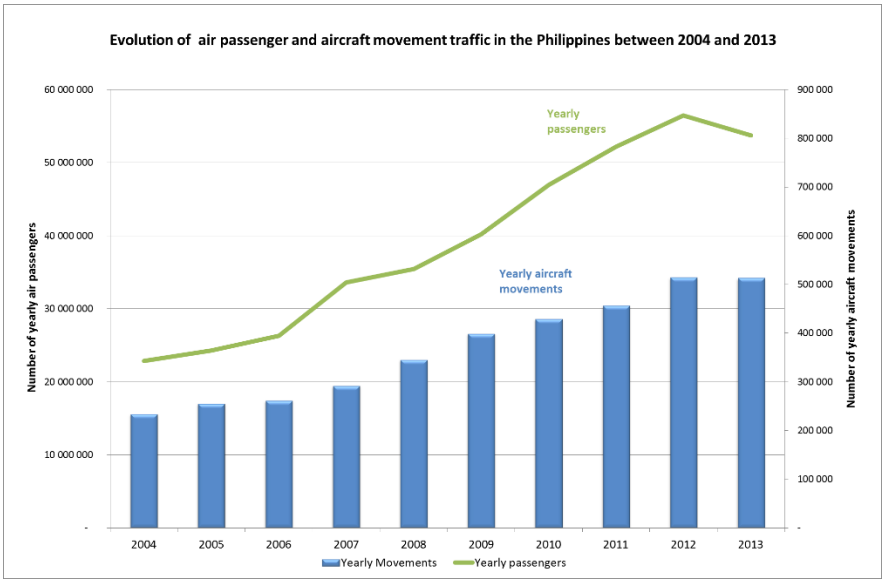

Fig.3. Evolution of air passenger and aircraft movement traffic in the Philippines between 2004 and 2013 (Source: The Philippines Civil Aviation)

2.4. Vietnam

The economy of Vietnam represents 5.5% of the total ASEAN GDP in 2013. It is a populated country, with 88 million inhabitants. GDP growth in Vietnam averaged 6.2% per year between 2004 and 2013 (source World Bank). This growth is explained by the accelerated growth in services (+6.6%), especially hotels and restaurants (+9%). Inflation averaged 6.6%, a steep decline from 18.6% in 2011 (Asian Development Outlook).

Vietnam is ranked 5th in ASEAN in terms of number of yearly tourists in ASEAN. The country welcomed 7.6 million tourists in 2013 (source Vietnam Ministry of tourism) which represents around 8% of the total tourists of the ASEAN region. The average tourist rate of growth reached 11% per year between 2005 and 2013. It is higher than the average rate of growth in the ASEAN region (8%). This increase stresses the increasing importance of tourism activity in the country.

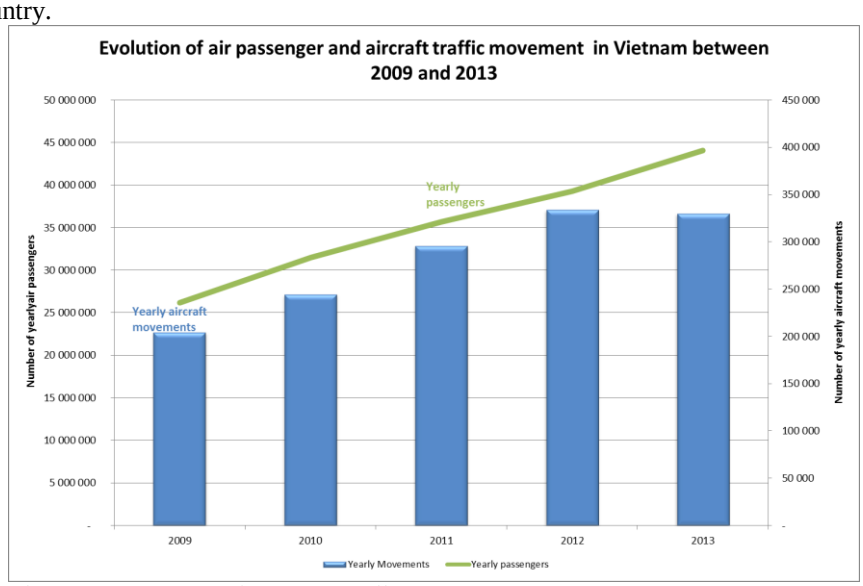

Fig.4. Evolution of air passenger and aircraft movement traffic in Vietnam between 2009 and 2013 (Source: Vietnam Civil Aviation)

The air traffic operated to and from Vietnam airports represents 9% of the total ASEAN passenger traffic in 2013

(Source: World Bank). The average yearly traffic growth between 2009 and 2013 is 8%. The air transport market in Vietnam is growing very rapidly. International traffic comes into and goes out of Vietnam via three main international airports: Tan Son Nhat International airport, Noi Bai International airport and Da Nang international airport. The largest airport is Tan Son Nhat, which concentrates 45% of the total passenger traffic in Vietnam.

The four countries described above exhibit high heterogeneity in their socio-economic characteristics (in terms of level and/or rate of growth). The development of air transport is also different from one country to the other. The differences in geographic characteristic of the countries are additional elements that influence air transport development. Because of this high heterogeneity between countries, we estimate the impact of liberalization on GDP independently for each country. Technically we argue that the amount of individual available information is too light to be able to capture the specificities of each country into a global model.

3. Methodology

We develop an econometric model aiming to quantify the economic impacts of the air transport liberalization up to the 5th freedom right in the ASEAN countries. We implement a two stages methodology. First, we estimate a model which expresses, for each country, the relationship between the economic development and the air traffic, in terms of number of passengers. The level of GDP is used as a proxy for the economic development. Then, based on tourism or passenger growth scenarios between 2015 and 2020, we use this econometric model to forecast the potential impact on GDP growth up to 2020. The analysis is implemented at regional level, focusing on regions that include at least one airport. The regional impacts depend on the socioeconomic characteristics of the region at stake.

3.1. First stage: estimation of the impact of air traffic on GDP

We express a linear relationship between the yearly regional GDP and the yearly number of passengers at airports. In order to control for the temporal effect, the estimation is performed using difference by difference methodology. The variables included in the model are therefore expressed in terms of yearly evolution.
Socioeconomic differences between regional areas are considered by introducing airport fixed effects: any change in passenger or tourist number might have different impact on economic growth, depending on the airport characteristics. In particular whether the airport is domestic or international might be of particular importance. A dummy variable is introduced to distinguish between international and domestic airports. Yearly fixed effects are included when necessary to take into account some unobservable or non-measurable socio economic chocks or any particular event.
There is an uncertainty regarding the sense of causality between the GDP and the number of passengers. Is the evolution of passengers that affects the GDP? Or, is the evolution of GDP that impact the number of passengers? To control for the sense of causality, we use the usual instrumental variable econometric method. The instruments are the yearly number of tourists, the percentage of international air passengers into the corresponding region, and all the other exogenous variables of the model. The percentage of international air passengers is used to take into account the structure of air traffic on the different areas.
The relationship between GDP and the number of passengers is expressed:

$$\begin{aligned}\text{GDP of city/region} = \; & \alpha \times \text{Passenger number in city/region} + \beta \times \text{airport fixed effect} \\ & + \sigma \times \text{domestic airport} + \gamma \times \text{yearly fixed effect} + \mu\end{aligned}$$

Equation 1

where α, β, σ and γ are the parameters to be estimated, μ is the error of the model. μ includes all the factors which impact the level of GDP and that we cannot observe.The instrumental variable method consists of estimating first the regional number of passengers on the different instruments. We use the following linear regression:

$$\begin{aligned}\text{Passenger number in city/region} = \; & \delta \times \text{tourist number} + \eta \times \text{percentage of international passengers} \\ & + \upsilon \times \text{domestic airport} + \tau \times \text{regional fixed effect} + \nu \times \text{yearly fixed effect} + \psi\end{aligned}$$

Equation 2

where δ, η, υ, τ and ν are the parameters to estimate, and ψ is the error of the model. As in the previous estimation, the model is estimated using difference by difference estimation.

The whole model (Equation 1 and Equation 2 together) is estimated using the model procedure in SAS where we specify 3SLS method which takes into account both endogeneity of some of the regressors and cross-equation correlation of the errors. The parameter of interest of this model is the parameter α, in Equation 1, which is a measure of the sensitivity of GDP with respect to the number of passengers. This parameter allows the measure of elasticities: how many changes in GDP following a 1% change in the number of passengers?

The interpretation suggested is the following: a sensitivity below 1% means that the major part of travellers spending is made at the airport. Percentages exceeding 1% shows that air travellers do not only spend money at the airport, but also around it when using other transports modes, or in the region thanks to their stay (restaurants, hotels, shops, and cultural sites).

The econometric model is based on two main assumptions:

- Regional GDP

The objective is to estimate the impact of the air traffic development at the regional level. This implies to observe GDP at the regional level. For many countries, this information is unavailable and we make the strong assumption that regional GDP is proportional to the number of inhabitants in the region.

The GDP per inhabitant is calculated at the national level and multiplied with the proportion of regional population. The regional populations are found through public sources for a unique year in general. We assume that the proportion of regional population remains constant during the period of analysis 2004-2013.

The notion of region differs from one country to the other, and depends on the characteristics of the country as well as on the available data. Some of the country are analyzed at the regional level, some others at city level. The unique imperative is the location of at least one airport into the geographic area.

- Split between domestic and international traffic

We include the percentages of international air passengers into the analysis of the evolution of passengers. This percentage is interpreted as the structure of air transport activity. It is assumed to remain constant over the period of analysis. We assume no evolution of the traffic structure between 2004 and 2013.

Regarding international airport, we set the share of international passengers equal to its average level on the observed period 2004-2013. Regarding domestic airport, we keep the share of international passengers equal to zero.

3.2. Second stage: anticipation of the future – Forecasts of the impact of air traffic on GDP

Forecasting the air traffic impact on GDP up to 2020 requires including forecasts of the number of air passengers in Equation 1.

Based on tourist predictions up to 2020, a preliminary step consists in using the relationship between passengers and the number of tourists (Equation 2) to assess the impact of the increase in the number of tourists on the number of air passengers. Then, the impacts on GDP are estimated by introducing the air passenger forecasts in Equation 1.

The forecasts are implemented under assumption 2: the share of international passengers remains constant for the period of prediction. Some robustness analyses have been performed. We use the Monte Carlo technique of simulation available in the model procedure of SAS. It consists in assessing the different potential economic impact when modifying the value of the estimated errors and parameters of the econometric model inside their respective confident intervals. As a consequence we obtain a distribution of the regional impact rather than a single value.

The final step through the measure of the potential air traffic growth on GDP is the comparison between GDP forecasts in 2020 and GDP observed in 2013, at regional and national levels.

4. Data

The quality of the analysis is highly dependent on the quality of the data provided by the different countries. The period of data required for the analysis is 2004-2013. The countries provided the best data that they have available. However, there is a large heterogeneity from one country to the other. We had to find alternative sources of data

and/or needed to make strong assumptions to be able to reach the objectives[**]. This is particularly the case for the anticipations of the future.

Many different public sources or national reports were used to collect the full dataset required for the analysis. In particular macroeconomic data, GDP, population, trade come from these public sources. For the estimation of the model, two different types of data are required. The first type is related to air transport. The different countries provided the traffic at airport level, split into domestic and international traffic. Air traffic data is provided on a yearly basis. The second type of data is related to socio-economic indicators, in particular GDP and tourism activities. Most of the time, these indicators are collected at national level. Regarding the anticipation up to 2020, some countries, but not all, provided traffic forecasts in terms of air passengers and/or tourism forecasts in terms of number of international tourists.

The methodologies proposed is based on a number of information, at the State, regional or airport level. For instance the analysis of air traffic variation on the GDP is implemented at the regional or airport city level. To assess this effect the regional/local GDP needs to be observed. The required data was unfortunately not always available. In this case we make some assumptions, which are based on our knowledge of the region under consideration, its socio-economic characteristics, as well as our experience from previous similar analysis.

Concerning LaoPDR, yearly airport passenger traffic are provided by the Lao PDR Civil Aviation from 2009 to 2013; GDP and population are collected from the World Bank website; tourism activity statistics are provided by the Laotian Ministry of Tourism. Projections made by the Lao PDR Ministry of 4.7 million tourists by 2020 are also used. Air passenger data are not available before 2009. For LAO PDR the period of analysis is restricted to 2009-2013.

Concerning Myanmar, yearly passenger airport are provided by the Myanmar Civil Aviation from 2003 to 2013; GDP and population are collected from the World Bank website; tourism activity statistics are provided by the Myanmar Ministry of Tourism. Forecasts of the international number of tourists have also been collected from the Ministry of Tourism which assumes that the country will welcome 7.849 million tourists by 2020.

Concerning the Philippines, yearly passenger airport traffic are provided by Filipino Civil Aviation from 2004 to 2013; GDP and population are collected from the World Bank website; tourism activity statistics are provided by the Filipino Statistics Authority. The number of tourists in the country is 4.7 million in 2013. We, unfortunately, do not have any tourism forecasts nor traffics forecasts for this country. But we can observe during the five past years a 10% yearly rate of growth on average. We assume that this 10% average yearly growth will continue up to 2020.

Concerning Vietnam, yearly passenger airport traffic are provided by the Vietnam Civil Aviation from 2009 to 2013; GDP and population are collected from the World Bank website; tourism activity statistics are provided by the Vietnam Ministry of Tourism. On its web portal (http://www.chinhphu.vn), the Socialist Republic of Vietnam government forecasts a 12% increase per year in the number of international tourists by 2020. We therefore use this assumption to run the econometric model. Air passenger data are not available before 2009. For Vietnam the period of analysis is restricted to 2009-2013.

5. Results[††]

Thanks to the estimated parameters in Equation 1, regional GDP elasticities to airport traffic activity are measured. These elasticities represent the regional sensitivity to airport traffic growth. The second output of the model is the forecasted GDP growth for the period 2013-2020 linked with airport traffic forecasts and/or tourism development anticipations on the same period.

5.1. Elasticity of GDP with respect to airport traffic

Erreur ! Source du renvoi introuvable. presents the average regional GDP elasticities to airport traffic growth obtained from the joint estimation of Equation 1 and Equation 2. They are obtained by taking the average of the elasticities estimated for all the airports located in the regions. Regions are split into three categories: regions where

[**] The data building step are available on request.

[††] The result of the estimation of the different models are available on request. The quality of the estimations is validated thanks to usual statistical tests.

only domestic airports are located, regions where only international airports are located and regions with both domestic and international airports.

Table 1. Average regional GDP elasticity to airport traffic growth.

Average regional GDP elasticity to airports' traffic growth	Regions with domestic airports only	Region with international airports only	Regions with domestic and international airports
Lao PDR	0.15%	0.68%	
Myanmar	0.52%	4.07%	3.01%
The Philippines	0.10%	1.56%	0.27%
Vietnam	0.02%	0.14%	0.04%

Comparisons between average elasticities obtained in Lao PDR, Myanmar, the Philippines and Vietnam clearly show that regions where only domestic airports are located have the lowest elasticities while regions with only international airports have the highest ones. In these four countries, international airports are located either in capital cities or in regions with tourism activity. One main explanation of the strongest GDP sensitivity to international airport activity is related to the largest industrial and/or tourism development on that particular regions.
It is also particularly interesting to stress that Myanmar and the Philippines are the only countries with elasticities exceeding 1%. In Myanmar, as long as at least one international airport is located in the region, a 1% increase in the yearly passenger traffic at airports leads to a of 3% to 4% growth in regional GDP. In the Philippines, a 1% increase in the yearly passenger traffic in regions where only international airports are located leads to an increase of 1.56% of the regional GDP. Lao PDR and Vietnam GDP elasticities to airport traffic growth are always below 1% whatever the type of region into consideration. The regional economic growth in these countries is hence lesser sensitive to the airport activity growth than it could be in some regions of the Philippines or Myanmar.

5.2. Impact on GDP up to 2020

ASAM impact on GDP: Estimated GDP growth from 2013 to 2020	Regions with domestic airports only	Region with international airports only	Regions with domestic and international airports	Country
Lao PDR	+143%	+52%		+16%
Myanmar	+11%	+19%	+7%	+9%
The Philippines	+63%	+52%	+46%	+51%
Vietnam	+52%	+51%	+25%	+22%

presents air traffic impact on GDP forecasted up to 2020. Figures represent the GDP growth between 2013 and 2020 based on the number of tourist forecasts and using Equation 2 in a first step to obtain the air passengers forecasts. Then, impacts on GDP are estimated by introducing these air passenger forecasts in Equation 1.

Table 2. ASAM impact on GDP. Estimated GDP growth from 2013 to 2020.

ASAM impact on GDP: Estimated GDP growth from 2013 to 2020	Regions with domestic airports only	Region with international airports only	Regions with domestic and international airports	Country
Lao PDR	+143%	+52%		+16%
Myanmar	+11%	+19%	+7%	+9%
The Philippines	+63%	+52%	+46%	+51%
Vietnam	+52%	+51%	+25%	+22%

The forecasted GDP growth at a country level, between 2013 and 2020, differs a lot between countries. Such increase is strongly related to two main effects: the current contribution of the tourism activity on national GDP and the forecasted tourism activity growth expected by each country up to 2020. The tourism activity contribution to GDP is in 2013, quite close for Lao PDR, the Philippines and Vietnam (between 4 and 4.6%) but is lower for Myanmar (only 1.6%). This low tourism contribution to GDP explains that despite Myanmar expect multiplying by 3 its number of tourists by 2020, the economic impact is expected to be moderate: 9%. The explanation of the moderate expected economic growth for Lao PDR (+16% up to 2020) is however more related to the moderate tourism activity growth expected by 2020 (+23% in number of tourists) combined with the low tourism activity in 2013. Besides, countries with an important tourism activity such as the Philippines and Vietnam should benefit of a

GDP growth exceeding 20% between 2013 and 2020. The expected economic growth due to the ASEAN air transport liberalization is particularly important for the Philippines, which forecasts a tourism growth of 58% by 2020. At a regional level, it is particularly interesting to observe that for all countries, except Myanmar, the highest GDP growth should be in regions with domestic airports only. In other words, despite the fact that only international airports will be concerned by the air transport liberalization, domestic airports should also benefit from traffic increase at international airports which will play the role of national hubs. However, the stronger expected GDP growth in regions where only domestic airports are located does not mean that these regions will bring the highest contribution to the national GDP. The GDP level in these regions is generally lower than in regions with international airports where we observe the largest industrial and/or tourism development.

6. Conclusion

ASEAN Member States have decided to sign agreements which define the milestones for liberalization of air transport in the region. As a consequence of air traffic deregulation, national authorities face a trade-off between positive impacts on GDP and potential negative impacts, due to highest competition, on their flag carriers. One main issue concerns the impact of expected air traffic development on national economy. Can we quantify this impact? Can it be possible that some regions experience different effects depending on the characteristics of their airports? Will these impacts be homogeneous among countries of the region? Given some forecast on air traffic growth and /or tourist activity could it be possible to measure the impact for the next 5 years?

We answer to these questions by quantifying the relationship between GDP and air traffic demand up to the 5th freedom right (2020) for some ASEAN member states, at regional and national levels. We focus hour analysis on four ASEAN countries: Lao PDR, Myanmar, The Philippines and Vietnam. These countries provide us information related to air traffic for the period 2003-2013. Additionally some forecasts are available in terms of tourism development up to 2020. On the basis of these information and some other information related to socio-economic data that we picked-up on different public sources, we estimate the relationship between air traffic and GDP. We use the number of tourists as one of the instrumental variable to correct the endogeneity between GDP and air traffic demand. This method is also useful to predict the forthcoming impact on GDP using the forecast of tourists for the next 5 years, through the impact on air traffic.

Thanks to the estimated model we can estimate the sensibility of regional GDP to air traffic increase and we forecast the impact of traffic increase on GDP up to the 5^{th} freedom right. Because of heterogeneity between the different countries, the model is estimated independently for each country. The estimations are statistically significant.

We show that GDP is the most sensible to air traffic growth in region where only international airport is located, that is for region that exhibit the highest level of development. The elasticity is the highest in Myanmar where air traffic is the less developed and the lowest in Vietnam, whatever the region considered. Finally we show that up to the 5^{th} freedom right, national GDP is expected to increase by 9 (Myanmar) to 51% (The Philippines) depending on the country. The magnitude of the impact depends on the tourism development expectation as well as on the tourism contribution to GDP. The analysis show then the economic benefit of air transport liberalization are non-negligible for the ASEAN countries. Given the magnitude of the estimated effect, the benefits would certainly overlap the negative effect of competition on the flag carriers. The authorities should then encourage liberalization.

The main limits of the models developed lie in the assumptions that are necessary because of the lack of information on regional population and/or regional GDP. Moreover we have assumed that the structure of the traffic, that is the split between domestic and international traffic remains constant during the period of the analysis and for the period of forecast. Relaxing this assumption could allow to estimate more precisely the potential impact on the economy.

7. References

ATAG, 2004, The economic and social benefits of air transport, Air Transport Action Group

Boeing, 2014, Current Market Outlook.

ECORYS, 2012, Provision of a Consultancy Study for EASA: Economic impact of the ASEAN Single Aviation Market.

Hu, Y., Xiao, j., Deng, Y., Xiao, Y., & Shouyang, W., 2015, Domestic air passenger traffic and economic growth in China: evidence from heterogeneous panel models, Journal of Air Transport Management, 42, 95-100.

InterVISTAS-ga., 2006, The economic impact of air service liberalization, Washington, USA.

Ishutkina, M., Hansman, R., 2009, Analysis of the interaction between air transportation and economic activity: a world wide perspective, Cambridge, USA: MIT Internationam Center for Air Transportation (ICAT).

Marazzo, M., Scherre, R., Fernandes, E., 2010, Air transport demand and economic growth in Brazil: A time series analysis. *Transportation Research Part E, 46*, 261-269.

Tan, A., Jin, K., 2013, Clear take-off on ASEAN Open Skies, Straits Times.