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Grancay, Martin

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# The Economic Impacts of Air Transport Liberalization

*Martin Grančay*

## Abstract

Air transport liberalization constitutes a whole new level of globalization. The impacts it brings can be divided into direct, indirect, induced and catalytic. The magnitude of impacts is determined by various factors, including air transport liberalization multiplier, market saturation and the degree of liberalization of other sectors. Airlines profit from increased efficiency derived from economies of scale, economies of scope and density economies. On the demand side, the passengers enjoy better range of available destinations, higher frequency of service and new business models, such as was the entrance of low-cost carriers to the EU market in the second half of the 1990s.

## 1. Introduction

Air transport liberalization is a process of gradual abolition of limits on designation, capacity, frequency and tariff setting in civil aviation. It aims to create an efficient air transport structure based on free market mechanism where all the decisions are taken as a result of a mutual interaction of supply and demand. The role of national governments is limited to safety and security.

Usually impacts of air transport liberalization are divided into two groups: economic and environmental. In our opinion, this is insufficient – a category of “other” impacts has to be added, including development of new technologies and other qualitative changes.

Figure 1: Impacts of Air Transport Liberalization

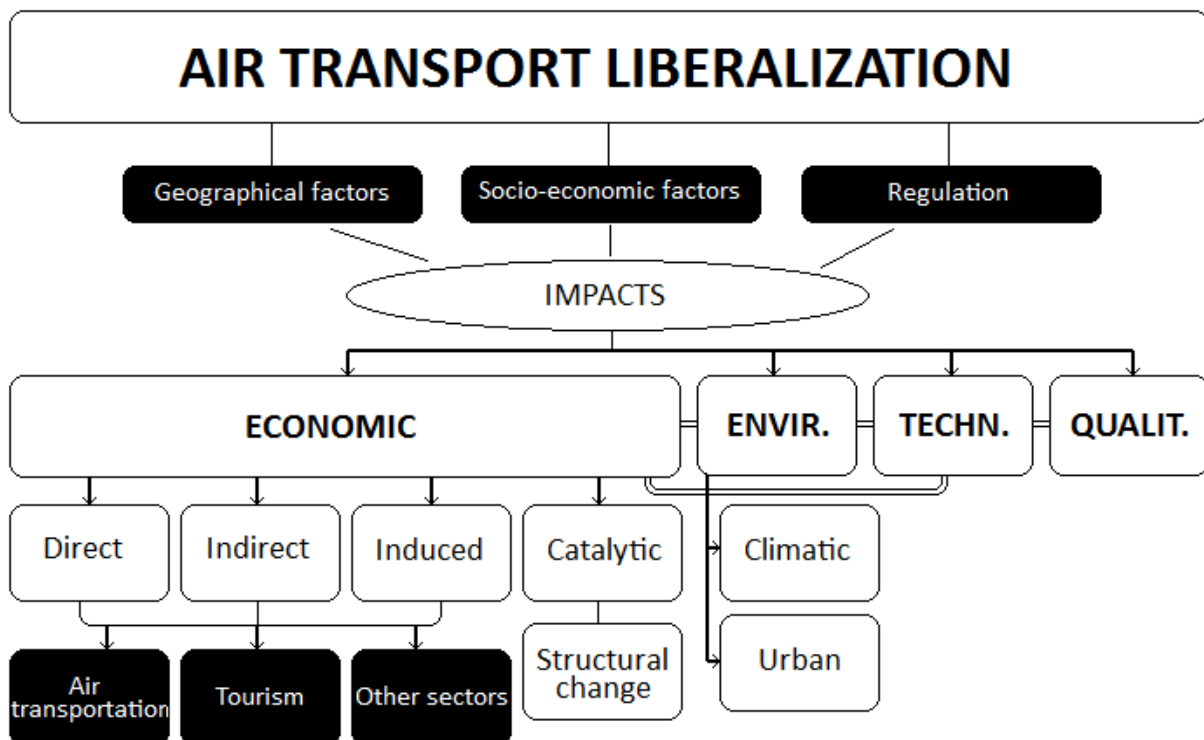
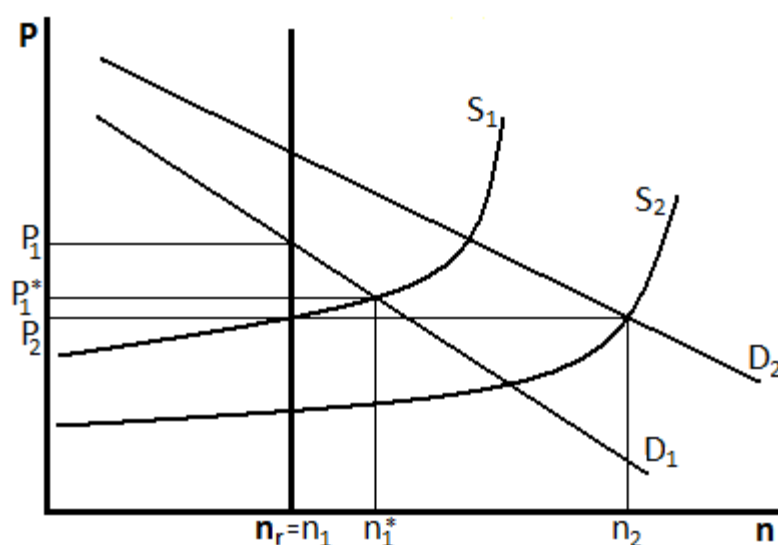


Figure 1 represents a schematic picture of different dimensions of air transport liberalization and the relations between them. It has to be mentioned that impacts of liberalization are not only influenced by changes in the regulatory environment, but also by various other factors. These include geographical and socio-economic characteristics of the regions, such as distance between the markets, their size, population density, existing geographical barriers, purchasing power, overall economic situation etc.

## 2. Impacts on supply and demand curves

From a macroeconomic point of view liberalization leads to a shift of supply and demand curves towards right, as demonstrated in figure 2.

Figure 2: Simple chart of air transport liberalization



Source: Adapted from BUTTON, K. – DREXLER, J.: *The Implications on Economic Performance in Europe of Further Liberalization of the Transatlantic Air Market*, 2006, p. 52. Changed.

In a protectionist environment the demand curve is  $D_1$  and the supply curve  $S_1$ . Air transportation between two countries is governed by restrictive air service agreement (ASA), setting fixed capacity and pricing limits and hindering alliance cooperation. The capacity limit ( $n_r$ ) implies that all the airlines on the market together are only allowed to transport  $n_r$  passengers. However, at this traffic level a considerable overhang of demand exists – the number of people wanting to fly exceeds the number of seats offered. Therefore air fares will be set above the equilibrium level  $P_1^*$ . As costs ( $P_1$ ) are much lower than prices ( $P_2$ ) airlines gain high profits and do not have incentives to increase their efficiency and invest in research and development.

Air transport liberalization consisting in abolishing the capacity constraint will affect both the number of passengers and air fares. The flight ticket prices will drop to  $P_1^*$ , leading to a traffic increase to  $n_1^*$  passengers. As a consequence of the closing gap between costs and revenue, the profit of airline industry will diminish. Airlines, in order not to get in the red, will have to adopt new cost-cutting procedures and invest in increasing efficiency.

Suppose the countries perform full liberalization of their aviation relations (e.g. sign an Open Skies agreement.) Each market player will be enabled to offer flights between any

two points in the countries with no capacity, frequency or pricing limits. Coupled with the ability to form strategic alliances, an outward shift of both supply and demand curves will follow. Airlines will be allowed to coordinate their activities, rationalize flight plans and offer better connections. They will be able to transport more passengers than before with the same total costs – a result of combining economies of scale, economies of scope and density economies. Therefore the original supply curve  $S_1$  will move to  $S_2$ . Outward shift of the demand curve (from  $D_1$  to  $D_2$ ) can be attributed to enhanced network of destinations, development of joint *frequent flyer* programs and overall increase in number of services offered, leading to more people willing to fly at an unchanged price level.

Figure 2 shows that applying the *ceteris paribus* rule, air transport liberalization leads to lower costs and higher number of passengers. The correlation between the degree of liberalization and traffic volumes seems to be strong. However, effects on air fares are disputable – the direction of their change depends on the shapes of supply and demand curves. Taking into account lower costs for airlines a decrease in flight ticket prices might be foreseeable. Empirical evidence shows this does not always have to be the case.

### 3. Air travel demand elasticities

To fully understand the roots of quantitative effects of liberalization it is helpful to study air travel demand elasticities. Demand elasticity is defined as „proportional change of quantity demanded that results from a proportional change in one of the factors of demand.<sup>1</sup>“ The most important types of elasticities are price elasticity and income elasticity.<sup>2</sup>

Air travel demand elasticities have received a wide attention from scientists in all parts of the world. Especially helpful sources of elasticity data are a paper by Gillen, Morrison,

<sup>1</sup> HOLKOVÁ, V. et al: Mikroekonómia, 2003, p. 114.

<sup>2</sup> *Price elasticity of demand* measures the sensitivity of demand to the change in price of a particular good or service. It is defined as proportional change in quantity demanded divided by proportional change in price. Thus, price elasticity of demand ( $E_{ii}$ ) shows the proportional change in quantity demanded that results from a 1% change in price of a good or service:

$$\text{Price elasticity } (E_{ii}) = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

Different values of price elasticity of demand show different reactions of demand to a price change:

$E_{ii} = 0$  – zero elasticity, demand is stable and completely independent from price changes;

$E_{ii} < 1$  – inelastic demand, the proportional change in quantity demanded is less than the proportional change in price;

$E_{ii} = 1$  – the proportional change in quantity demanded equals the proportional change in price;

$E_{ii} > 1$  – elastic demand, the proportional change in quantity demanded is greater than the proportional change in price.

*Income elasticity of demand* measures the sensitivity of demand to a change in income:

$$\text{Income elasticity } (E_{ij}) = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}$$

According to the values of income elasticity of demand we distinguish between „normal“ and inferior goods:

$E_{ij} > 0$  – normal goods; these include:

$E_{ij} < 1$  – necessary goods, the proportional change in quantity demanded is less than the proportional change in income;

$E_{ij} > 1$  – luxury goods, the proportional change in quantity demanded is greater than the proportional change in income;

$E_{ij} < 0$  – inferior goods, goods with negative income elasticity. Their consumption decreases with higher income.

Stewart<sup>3</sup> and a study by InterVISTAS group<sup>4</sup> – each of them constitutes a synthesis of other researchers' empirical and econometric studies.

There is no universal air travel demand elasticity value valid for all the markets. Rather, a wide range of elasticity values may be observed, depending on time factor, length of flight and purpose of travel. In general, long-term demand elasticity is higher than short-term demand elasticity. An unexpected increase in prices will only have small effects in short term as passengers have already made their travel plans and are mostly unable or unwilling to change them; however, in a long-term perspective passengers will adjust their expectations and change their behavior according to the new situation on the market. Longer flights usually have lower price elasticity than short ones – while short domestic flights can normally be easily substituted by other means of transport, intercontinental travel is virtually possible by air only. An exception from the above-mentioned rule is short-distance flights between points divided by geographical barrier such as sea or mountains (Alaska, Siberia etc.). Another important factor is the purpose of travel: short-term price elasticity of business passengers is low, as they can't afford to cancel the planned business trips. On the other hand, in a longer term personal negotiations might be substituted by videoconferences and other travels be re-booked from first/business class to economy class. Price elasticity of demand of leisure travel in economy class is considerably less time-sensitive.

The most frequently cited values of price elasticity of demand for air travel are 0.7-1.2. Gillen, Morrison and Stewart identify short leisure flights as the most elastic market segment with median value of 1.52.<sup>5</sup> This means a 1% increase in flight ticket prices leads to a 1.52% decrease in demand. Conversely, the least elastic market segment is constituted by long international business flights with median value of 0.27 – a 1% increase in flight ticket prices leads to a 0.27% decrease in travel. Regardless the exact elasticity values, it has to be noted that on the aggregate level price elasticity of demand for air travel is always positive. Therefore, any increase in flight ticket prices will always lead to a drop in passenger numbers. More importantly, any liberalization measures leading to a decrease in flight ticket prices will induce new demand and increase air travel. Full elasticity data for various segments of air transport is available in the Appendix.

The approach chosen by InterVISTAS is based on studying elasticities for different levels of aggregation.<sup>6</sup> The aim is to compare changes in demand caused by changes in air fares for three levels of aggregation:

- a) *route/market level* – A price change occurs on route A-B while prices of all other routes remain stable. Passenger, to avoid paying the increased price, can choose to travel on an alternative route, e.g. A-B<sub>2</sub>, A<sub>2</sub>-B or A<sub>2</sub>-B<sub>2</sub>.

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<sup>3</sup> GILLEN, D. – MORRISON, W. – STEWART, G.: Air Travel Demand Elasticities, 2003. Available at [http://www.fin.gc.ca/consultresp/Airtravel/airtravStdy\\_e.html](http://www.fin.gc.ca/consultresp/Airtravel/airtravStdy_e.html).

<sup>4</sup> InterVISTAS: Estimating Air Travel Demand Elasticities, 2007. Available at [www.iata.org/NR/rdonlyres/0E7F6834-2506-498B-9CB9-DCA198FA3BC/0/Intervistas\\_Elasticity\\_Study\\_2007.pdf](http://www.iata.org/NR/rdonlyres/0E7F6834-2506-498B-9CB9-DCA198FA3BC/0/Intervistas_Elasticity_Study_2007.pdf).

<sup>5</sup> GILLEN, D. – MORRISON, W. – STEWART, G.: Air Travel Demand Elasticities, 2003. Available at [http://www.fin.gc.ca/consultresp/Airtravel/airtravStdy\\_e.html](http://www.fin.gc.ca/consultresp/Airtravel/airtravStdy_e.html).

<sup>6</sup> InterVISTAS: Estimating Air Travel Demand Elasticities, 2007. Available at [www.iata.org/NR/rdonlyres/0E7F6834-2506-498B-9CB9-DCA198FA3BC/0/Intervistas\\_Elasticity\\_Study\\_2007.pdf](http://www.iata.org/NR/rdonlyres/0E7F6834-2506-498B-9CB9-DCA198FA3BC/0/Intervistas_Elasticity_Study_2007.pdf).

- b) *national level* – If a national government imposes a new tax on aviation, prices of all the flights from the country will increase. Passengers have only two ways to avoid the new price – choose a different mode of transport or start their journey from an airport in a different country.
- c) *pan-national level* – This represents the most aggregate level considered by InterVISTAS, occurring when air fares from a group of countries increase. A good example for this would be the European Union. For passengers it is almost impossible to avoid paying higher price in this case.

The conclusions drawn by InterVISTAS are not unexpected: higher levels of aggregation lead to lower price elasticities of demand. On route/market level the elasticity was found to be approximately 1.4; on national level the value drops to 0.8; the lowest price elasticity of demand can be observed on pan-national level – around 0.6. We could therefore claim that the broader the geographical extent of liberalization, the smaller effects it brings. However, such a view would be incorrect – we have to take into account other important phenomena connected with liberalization processes, such as demand creation and demand diversion. These tend to gain on importance with increasing level of aggregation.<sup>7</sup>

After analyzing 103 studies from different regions of the world Gillen, Morrison and Stewart approximate the income elasticity of air travel demand at 1.14.<sup>8</sup> Rigas Doganis comes to a different conclusion – according to his research average long-term income elasticity of demand reaches 2.00.<sup>9</sup> Thus, a 3-percent increase in global gross domestic product will lead to a 6-percent increase in passenger air traffic. Nevertheless he notes that recently the causal relationship between air transport volumes and economic growth has gotten weaker,<sup>10</sup> as a result of the boom of low-cost carriers. It is therefore necessary to study income elasticities from a partial perspective. InterVISTAS suggests following three criteria: length of haul, level of aggregation and country type.<sup>11</sup> The conclusions drawn from their research include:

- income elasticity of demand increases with length of haul;
- income elasticity of demand is generally higher in developing countries than in developed countries;
- income elasticity of demand decreases with increasing level of aggregation;
- notwithstanding the above-mentioned conclusions income elasticity of demand almost always takes values between 1.5 and 2.5 – that confirms the position of air transport as a luxury good.

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<sup>7</sup> For example, if air fare between London and New York decreases by 1% leading to a passenger increase of 1.4%, we assume a part of these passengers were diverted from different routes, such as Manchester-New York or London-Boston. The drop in flight ticket prices induces new demand on the London-New York route and diverts some passengers from other routes. If prices of ALL the flight connections between Europe and USA decrease, the demand creation effect will be lower than at the route level (e.g. 0.8%) as a result of lower price elasticity of demand. On the other hand, the demand diversion effect will be smaller as well – due to financial and time costs passengers originating outside of Europe will not be likely to travel to Europe to start their transatlantic journey there.

<sup>8</sup> GILLEN, D. – MORRISON, W. – STEWART, G.: Air Travel Demand Elasticities, 2003. Available at [http://www.fin.gc.ca/consultresp/Airtravel/airtravStdy\\_e.html](http://www.fin.gc.ca/consultresp/Airtravel/airtravStdy_e.html).

<sup>9</sup> DOGANIS, R: The Airline Business, 2006, p. 17.

<sup>10</sup> DOGANIS, R: The Airline Business, 2006, p. 18.

<sup>11</sup> InterVISTAS: Estimating Air Travel Demand Elasticities, 2007. Available at [www.iata.org/NR/rdonlyres/0E7F6834-2506-498B-9CB9-DCA198FA3BC/0/Intervistas\\_Elasticity\\_Study\\_2007.pdf](http://www.iata.org/NR/rdonlyres/0E7F6834-2506-498B-9CB9-DCA198FA3BC/0/Intervistas_Elasticity_Study_2007.pdf).

Supposing that air transport liberalization affects both air fares and general income level, any attempt to quantify its effects has to take into account both elasticities. However, as we have seen, values of income and price elasticities differ from each other and sometimes they even move in opposite directions – while price elasticity tends to decline with the length of flight, income elasticity usually rises. Magnitude of impacts of liberalization therefore depends on elasticity values at the respective market.

In general, the air transport demand curve has a typical decreasing shape. Raises in income level shift the curve towards right. D. Bhadra and R. Schaufele find this understandable, claiming that “as wages increase, the opportunity cost of time increases.”<sup>12</sup> Passengers will put more stress on speed than on price and as a result will prefer air transport to other modes of transport.

#### 4. Scientific approaches to liberalization

There are many approaches to studying air transport liberalization. Different scientists use different methods, including but not limited to mathematical, statistical, econometric and empirical research. K. Button and J. Drexler divide these approaches into three basic groups:

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- *survey techniques* – done through questioning people involved in air transportation, including professionals and passengers. Although this method often uncovers trends in behavior of market participants, its main problem is high level of subjectivity of the responses obtained. It can become a basis for lobbying rather than one of analysis if due caution is not taken.
- *input-output analysis and techniques using Keynesian multipliers* – done through tracing local expenditure on air transportation either in aggregate (multipliers) or by sectors (input-output analysis). The biggest issue of this approach is to correctly choose the time frame to consider in the analysis.<sup>14</sup> Also, the values of the multipliers might be difficult to estimate.
- *econometric methods* – building of complex mathematical and statistical models. Their main advantage consists in high ability to isolate the effects of changes in air transportation policy on local development (and thus approach the *ceteris paribus* rule). However, there is a risk of choosing inappropriate econometric model. Moreover the methods are highly data intensive.

Different approaches can be taken to classify liberalization impacts. After a thorough research of available literature we have identified six basic ways to divide liberalization impacts:

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<sup>12</sup> BHADRA, D. – SCHAUFELE, R.: Impact of United States-European Union Open Aviation Area..., 2008, p. 19.

<sup>13</sup> BUTTON, K. – DREXLER, J.: The Implications on Economic Performance in Europe..., 2006, pp. 12-13.

<sup>14</sup> The factor of time is one of the most important problems of any research in the field of air transportation. The delay between the time a market change occurs and the time its impacts start to be evident is difficult to predict. Flight plans are published twice a year only and airlines usually prepare them a couple years in advance. Therefore today's regulatory changes in air transportation markets will show their full impacts with a months- to years-long delay. The biggest problem is to predict the length of this delay.

- direct, indirect, induced and catalytic impacts;<sup>15</sup>
- primary, secondary, tertiary and perpetuity impacts;<sup>16</sup>
- aviation sector impacts, tourism sector impacts and catalytic impacts;<sup>17</sup>
- impacts on trade and impacts on competition;<sup>18</sup>
- competition effects, cost reducing effects and cost difference effects;<sup>19</sup>
- cost savings, price reductions and output expansion.<sup>20</sup>

Each of these approaches (and many others as well) studies the same magnitude of market changes but using different methodology. In our opinion, the most convenient and complex research method is dividing impacts into direct, indirect, induced and catalytic (See figure 2.) It is necessary to note that this categorization assumes existence of causal relationship between air transport liberalization and traffic growth. As shown in figure 3 liberalization brings better air services, leads to higher traffic and finally induces economic growth and creation of new jobs.<sup>21</sup>

Figure 3: Causal relationship between liberalization and economic growth



Source: *InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, p. 11.*

The strength of the link between traffic growth and economic growth is different for every economy. It depends on various factors, such as level of employment, propensity to import and whether increased air travel diverts expenditures from other forms of consumption, savings and investment.

## 5. Economic impacts of air transport liberalization

**Direct impacts** of liberalization (*D*) “arise immediately from the conduct of those entities performing the activity in question.”<sup>22</sup> In case of air transportation this means direct

<sup>15</sup> Catalytic impacts include supply-side and demand-side catalytic impacts. (Eurocontrol: The Economic Catalytic Effects of Air Transport in Europe, 2005, p. 11.) This approach has also been adopted by IATA (Air Transport Action Group: The Economic and Social Benefits of Air Transport 2008) and InterVISTAS (InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, p. 5).

<sup>16</sup> BUTTON, K – TAYLOR, S.: International Air Transportation and Economic Development, 2000, p. 214. Also BUTTON, K. – DREXLER, J.: The Implications on Economic Performance in Europe..., 2006, pp. 11-12.

<sup>17</sup> InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, p. 81.

<sup>18</sup> FORSYTH, P. – KING, J. – RODOLFO, Ch.L.: Open Skies in ASEAN, 2006, p. 147.

<sup>19</sup> ELEK, A. – FIDLAY, C. – HOOPER, P. – WARREN, T.: Open Skies or Open Clubs?..., 1999, p. 150.

<sup>20</sup> ROBYN, D. – REITZES, J. – MOSELLE, B.: Beyond Open Skies..., 2005, p. 58.

<sup>21</sup> The acceptability of this assumption is evidenced by multiple empirical and econometric analyses. A good example is a study elaborated by InterVISTAS, quantifying impacts of liberalization of 5 different international markets. The markets include United States-United Kingdom, intra European Union, United Arab Emirates-U.K. and Germany, Australia-New Zealand and Malaysia-Thailand. InterVISTAS comes to a conclusion that in each of these cases liberalization led to an increase in air traffic by 12-50% and there was robust evidence of its positive impact on employment and economic growth. (See InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, p. 18-58.) Another study by George Mason University estimates that liberalization leading to transformation of an airport to a hub creates 12 thousand new jobs. (BUTTON, K. – DREXLER, J.: The Implications on Economic Performance in Europe..., 2006, p. 11.)

<sup>22</sup> InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, p. B-2.



impacts include all the changes in employment, value added or total product that can be immediately attributed to changes in air traffic level. These changes affect airlines, airports, ground handling agents, aircraft producers, maintenance providers, ATC providers and other companies whose principal business involves commercial aviation.

**Indirect impacts ( $I$ )** are defined as impacts “involving the supply chain of businesses or entities conducting the primary activity.”<sup>23</sup> Higher number of flights requires increased orders of fuel and in-flight services. Higher number of passengers boosts turnover of airport retail outlets. Higher demand for aircrafts supports the extensive network of sub-contractors. All in all, indirect impacts involve growth of purchases by airlines, airports, aircraft producers, airport retail outlets and hotels. They also include construction activity at the airports and services provided by call centers. It is obvious that the magnitude of indirect impacts is primarily influenced by the extent of direct impacts. Therefore indirect impacts are computed as  $I = a.D$ , where  $a$  is a market-specific coefficient.

**Induced impacts ( $N$ )** emerge when “those employed directly and indirectly in air transport services use their earnings to buy other goods and services.”<sup>24</sup> A pilot might use a part of his salary to buy computer. This represents income for the computer seller, who might subsequently spend it at a bookstore; the bookseller might spend it at a grocery store etc. The process will continue indefinitely in decreasing cycles. Thus, the initial increase in salary of one person is transformed into increase in salaries of many households. This process is known as the multiplier effect. If air transport liberalization directly or indirectly creates  $n$  new jobs, the national income will increase by  $\Delta Y = \sum_{i=1}^n w_i$ , where  $w_i$  is the wage of employee  $i$ . A part of this income will be saved and the rest will be spent, depending on propensity to consume ( $c$ ) and propensity to save ( $s$ ). The change in consumption  $\Delta C = c.\Delta Y$  creates new income for other market entities who consume a part of it and save the rest. The total multiplier effect in its simple version can be computed as  $\beta.\Delta Y = \Delta Y / s$ , where  $\beta$  is a multiplier. As a result of this induced impacts equal the sum of direct and indirect impacts multiplied by the multiplier:  $N = \beta.(D + I)$ , that is  $N = \beta.(D + a.D)$ .

**Catalytic impacts ( $C$ )** are a very wide and diverse group. They are defined as “net economic effects (e.g. on employment, incomes, government finances etc.) resulting from the contribution of air transport to tourism and trade (demand-side effects) and the long-run contribution to productivity and GDP of growth in air transport usage (the supply-side performance of the economy).”<sup>25</sup> They include all the impacts of air transport liberalization on national economies that cannot be described as direct, indirect or induced. As a result of market changes brought about by liberalization people alter their consumption patterns – they travel to destinations they normally wouldn’t, businesses focus on new markets, alter their production methods etc. Most of the catalytic impacts are utterly difficult to measure. They should be perceived as indicators of quality rather than quantifiable indicators.

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<sup>23</sup> InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, p. B-4.

<sup>24</sup> Eurocontrol: The Economic Catalytic Effects of Air Transport in Europe, 2005, p. 11.

<sup>25</sup> Eurocontrol: The Economic Catalytic Effects of Air Transport in Europe, 2005, p. iv.

There are various types of catalytic impacts:<sup>26</sup>

a) *Demand-side catalytic impacts*

- Tourism effects – increased number of passengers supports consumption in tourism sector. This can be seen literally in every tourism segment, starting with hotels and restaurants, through entertainment to public transportation. As many developing countries' economy is based on tourism sector, liberalization of air transport constitutes an important element of their success.
- Trade effects – air transport liberalization opens new markets to many businesses as a result of new destinations, better flight connections and higher frequencies offered. This leads to a broader demand for existing products.

b) *Supply-side catalytic impacts*

- Investment effects – one of the most important factors transnational corporations take into account when taking decisions about location of headquarters is proximity of an international airport. This is evidenced by numerous research papers.<sup>27</sup> For example, according to Bel and Fageda a 10 per cent increase in provision of intercontinental flights involves around a 4 per cent increase in the number of headquarters located in the corresponding urban area.<sup>28</sup>
- Productivity effects – while providing access to new markets air transport liberalization enables businesses achieve higher efficiency through exploiting economies of scale. Better network of destinations also helps diminish warehousing costs, enabling extensive use of just-in-time deliveries.
- Labor market effects – air transportation makes it easier for companies to attract high quality employees from around the globe. It enables inter-regional migration of labor force – the most important factor is decreasing the time necessary to commute from one's home to work. Thanks to good air connections many people find employment in a region they wouldn't even consider otherwise. However, migration is a bi-directional phenomenon and thus can lead to brain-gain as well as brain-drain.
- Structural effects – the most important and permanent impact of air transport liberalization is the change of market structure. Domestic producers get easier access to foreign markets; conversely, home-market competition is increased owing to the entry of foreign exporters. This leads to extensive changes in the matrix of comparative advantages of the economy. These changes are permanent. For example, it is literally impossible to develop an economy based on hi-tec industries without access to fast and reliable air transportation network.

Direct, indirect, induced and catalytic impacts in their combination lead to a change in Gross Domestic Product of an economy:

$$\Delta GDP = D + I + N + C + e. \quad (1)$$

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<sup>26</sup> See Air Transport Action Group: The Economic and Social Benefits of Air Transport 2008; Eurocontrol: The Economic Catalytic Effects of Air Transport in Europe, 2005; InterVISTAS: The Economic Impact of Air Service Liberalization, 2006.

<sup>27</sup> For a list of these works see: InterVISTAS: The Economic Impact of Air Service Liberalization, 2006, pp. 86-87.

<sup>28</sup> BEL, G. – FAGEDA, G.: Getting There Fast..., 2005, p. 20.

$E$  stands for other unexpected random impacts. Further changing the equation:

$$\begin{aligned}\Delta GDP &= D + a.D + \beta.(D + a.D) + C + e \\ \Delta GDP &= (1 + a + \beta + a.\beta).D + C + e\end{aligned}$$

After substituting  $(1 + a + \beta + a.\beta)$  for  $\psi$ :

$$\Delta GDP = \psi.D + C + e, \quad (2)$$

where  $\psi$  is the air transport liberalization multiplier. According to the equation, if  $\psi$  equals 0 GDP changes only as a result of catalytic and random impacts. However, a situation where  $\psi=0$  means liberalization did not bring any direct or indirect impacts and therefore it couldn't have brought catalytic impacts either. If  $\psi$  equals 1 direct impacts will not lead to any indirect effects. This situation is clearly hypothetic as it is difficult to imagine a market environment where growth in air transport sector does not induce growth in related sectors. Even in case of low-cost carriers (not offering any in-flight services) increased number of passengers will lead to increased fuel consumption – a clear example of an indirect impact.

Owing to different price and income elasticities of demand of different segments of air transport the final version of the equation has to be an aggregate of the impacts in respective segments:

$$\Delta GDP = \sum_{i=1}^n \Delta GDP_i = \sum_{i=1}^n (\psi_i.D_i + C_i) + e \quad (3)$$

It becomes obvious that total impacts of liberalization are determined by three factors: the value of multiplier  $\psi_i$ , the extent of direct impacts  $D_i$  and the extent of catalytic impacts  $C_i$ . All of these are relatively independent from each other and are influenced by hundreds of other factors. The most important of them are shown in table 1.

Table 1: Factors determining the extent of total impacts of air transport liberalization

Multiplier $\psi_i$	Direct impacts $D_i$	Catalytic impacts $C_i$
Propensity to consume	Airport capacity and aviation infrastructure	Degree of liberalization of labor markets
HDP/capita	Business model of airlines	Tax system
Employment rate	Level of market saturation	Marketing in tourism sector
	Price elasticities of S and D	Existing market structure
	Geographical factors	Quality of non-aviation infrastructure

A study elaborated by Oxford Economics for Air Transport Action Group tries to approximate the impact of air transport on employment and GDP. In 2006<sup>29</sup> air transport generated 5.5 million direct jobs, 6.3 million indirect jobs, 2.9 million induced jobs and 17.2 million catalytic jobs in tourism sector. This brings the total to 31.9 million jobs plus other millions that were generated in trade. The direct impacts on GDP growth reached 408 billion USD, indirect impacts 465 billion USD, induced impacts 220 billion USD and catalytic impacts on tourism sector GDP constituted 389 billion USD. If we include catalytic impacts

<sup>29</sup> Owing to data intensiveness of this kind of research more recent estimates are not available. See: Air Transport Action Group: The Economic and Social Benefits of Air Transport 2008, p. 5.

on trade, the total contribution of air transport to global GDP in 2006 reached 3.6 trillion USD, i.e. 7.5% of the global GDP.

This statistics shows that one dollar directly invested in civil aviation leads to direct, indirect and induced impacts of 2.6 dollars in total – therefore the air transport liberalization multiplier can be approximated at 2.6. However, it should be noted that this does not include catalytic impacts: The value of catalytic impacts themselves is twice as high as the value of all the other impacts together!

Other methods of estimating the extent of air transport liberalization impacts should bring the same results as the one we have analyzed. For example, if we choose to divide the impacts into primary, secondary, tertiary and perpetual, their total should equal the total of direct, indirect, induced and catalytic impacts.

## 6. Conclusion

As demonstrated in this paper, economic impacts of air transport liberalization are wide and significant. „In a liberalized market, more efficient airlines would replace less efficient ones, or less efficient airlines would adopt the practices of more efficient ones, leading to significant cost savings and an increase in industry efficiency.“<sup>30</sup> Increased competition and successful restructuring of the air transportation industry will bring along three different types of cost savings:

- *Economies of scale* – owing to higher passenger base;
- *Economies of scope* – derived from the development of hub airports;
- *Density economies* – better co-ordination of flights in airline's network leading to higher load factors.

On the supply side liberalization increases the number of services available to passengers – the main advantages include higher frequencies, new destinations and shorter layovers. Liberal environment works as accelerator of change and may induce development of new business models, such as was the boom of low-cost carriers in Europe after the creation of Single European Aviation Market in 1997. The majority of researchers agree emergence of low-cost carriers was the main qualitative impact of air transport liberalization in Europe, a game-changer that caused a deep structural change.<sup>31</sup> However, the limitations of low-cost model are obvious and it cannot be expected that low-cost airlines become major players at intercontinental markets anytime in the near future. Rather they will continue in their function as niche long-haul carriers. Long-term predictions are more complicated – if air transport liberalization becomes global phenomenon, emergence of a brand new business model is possible. Free market leads to increased competition and creates incentives for innovation. One such innovation will sooner or later bring about important structural changes to both trans-Atlantic, trans-Pacific and other long-haul markets.

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<sup>30</sup> ROBYN, D. – REITZES, J. – MOSELLE, B.: Beyond Open Skies..., 2005, p. 58.

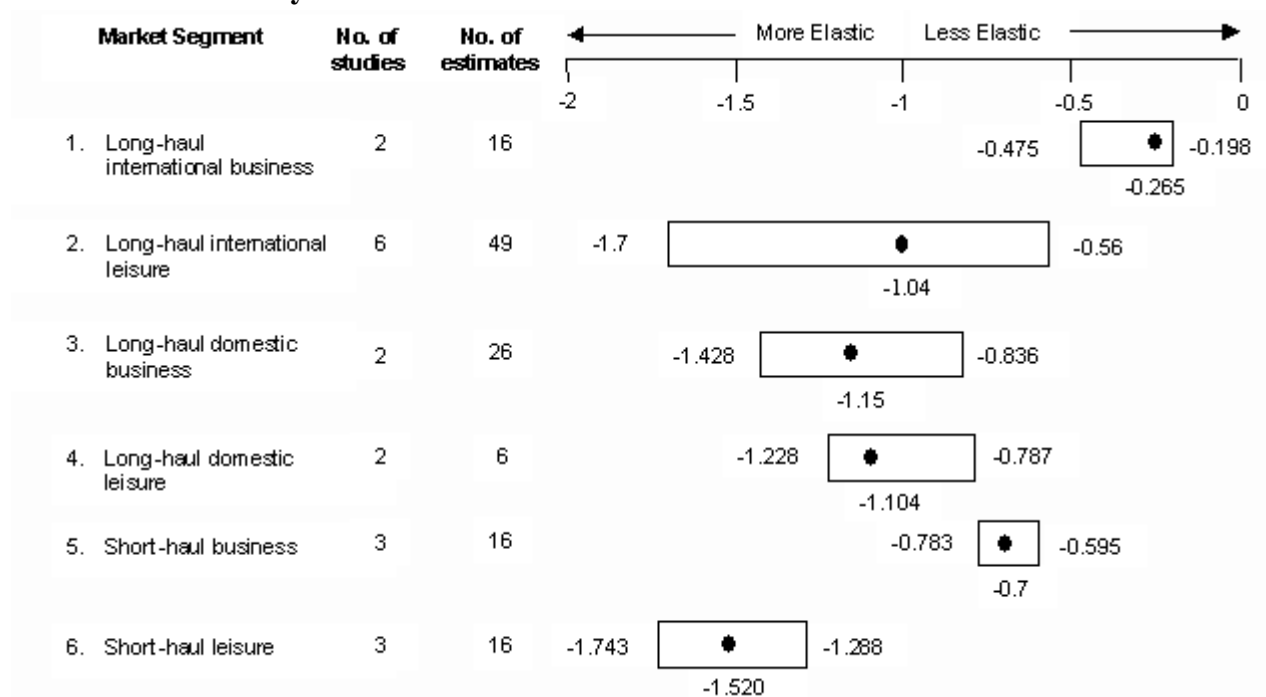
<sup>31</sup> FORSYTH, P. – KING, J. – RODOLFO, Ch.L.: Open Skies in ASEAN, 2006, p. 147.

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## Appendix

### 1. Price elasticity of demand for air travel:



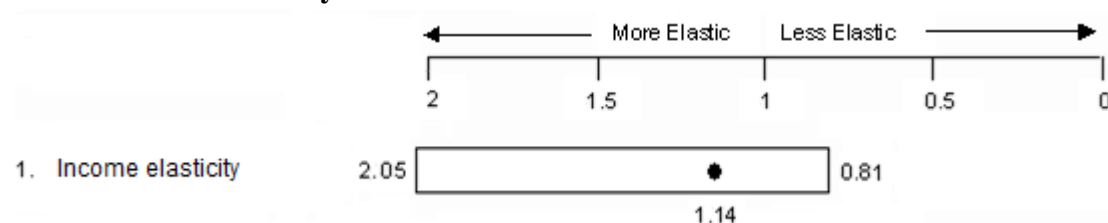
Source: GILLEN, D. – MORRISON, W. – STEWART, G.: *Air Travel Demand Elasticities*, 2003.

### 2. Regional price elasticities of demand:

Level of aggregation Flight length	Route/market level		National level		Pan-national level	
	short	long	short	long	short	long
North America	1.50	1.40	0.88	0.80	0.66	0.60
Europe	1.96	1.96	1.23	1.12	0.92	0.84
Asia	1.46	1.33	0.84	0.76	0.63	0.57
Sub-Saharan Africa	0.92	0.84	0.53	0.48	0.40	0.36
South America	1.93	1.75	1.10	1.00	0.83	0.75
Transatlantic	1.85	1.68	1.06	0.96	0.79	0.72
Transpacific	0.92	0.84	0.53	0.48	0.40	0.36
Europe-Asia	1.39	1.26	0.79	0.72	0.59	0.54

Source: InterVISTAS: *Estimating Air Travel Demand Elasticities*, 2007, p. 36.

### 3. Income elasticity of demand for air travel:



Source: GILLEN, D. – MORRISON, W. – STEWART, G.: *Air Travel Demand Elasticities*, 2003.

#### 4. Regional income elasticities of demand:

Flight length	Route/market level			National level		
	<i>USA</i>	<i>D-ed</i>	<i>D-ing</i>	<i>USA</i>	<i>D-ed</i>	<i>D-ing</i>
<i>Short</i>	1.8	1.5	2.0	1.6	1.3	1.8
<i>Medium</i>	1.9	1.6	2.0	1.7	1.4	1.8
<i>Long</i>	2.0	1.7	2.2	1.8	1.5	2.0
<i>Very long</i>	2.2	2.4	2.7	2.0	2.2	2.5

D-ed – developed nations minus USA, D-ing – developing economies

Source: InterVISTAS: Estimating Air Travel Demand Elasticities, 2007, pp. 37-38.