Economic benefits of reducing aviation taxes in Latin America and the Caribbean

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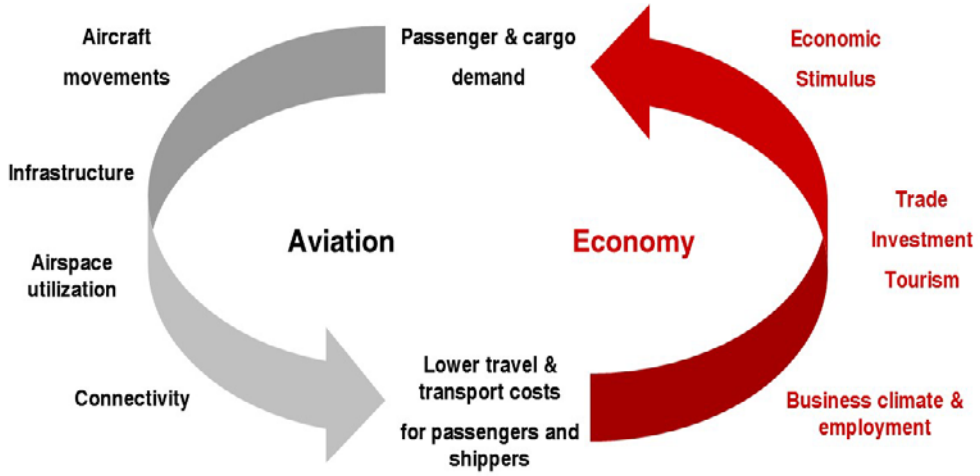
Executive summary

Connectivity is key to competitiveness

Aviation plays a crucial role in today's globalized society. The connectivity by air it generates is a key element for the competitive position of countries in Latin America and the Caribbean, its regions and cities. A superior connectivity performance minimizes travel costs for passengers, businesses and shippers. It generates agglomeration economies, stimulates productivity, trade, R&D and foreign direct investment. Furthermore, airports and civil airspace users support many jobs in the economies of Latin America and the Caribbean. **Almost 4.9 million jobs and 153 billion USD of GDP are currently directly or indirectly related to aviation in Latin America and the Caribbean**. As a result, there is an increased understanding among policy makers about the potential benefits of connectivity to the economy.

Figure 1.1 Virtuous circle of connectivity growth and economic growth



The overall connectivity performance of countries in Latin America and the Caribbean has improved substantially over the past decade. Total direct, non-stop connectivity and indirect connectivity (via other hubs) increased by 23 percent between 2004 and 2014. For the many islands and peripheral cities in the region, connectivity by air is essential for their economies and social well-being.

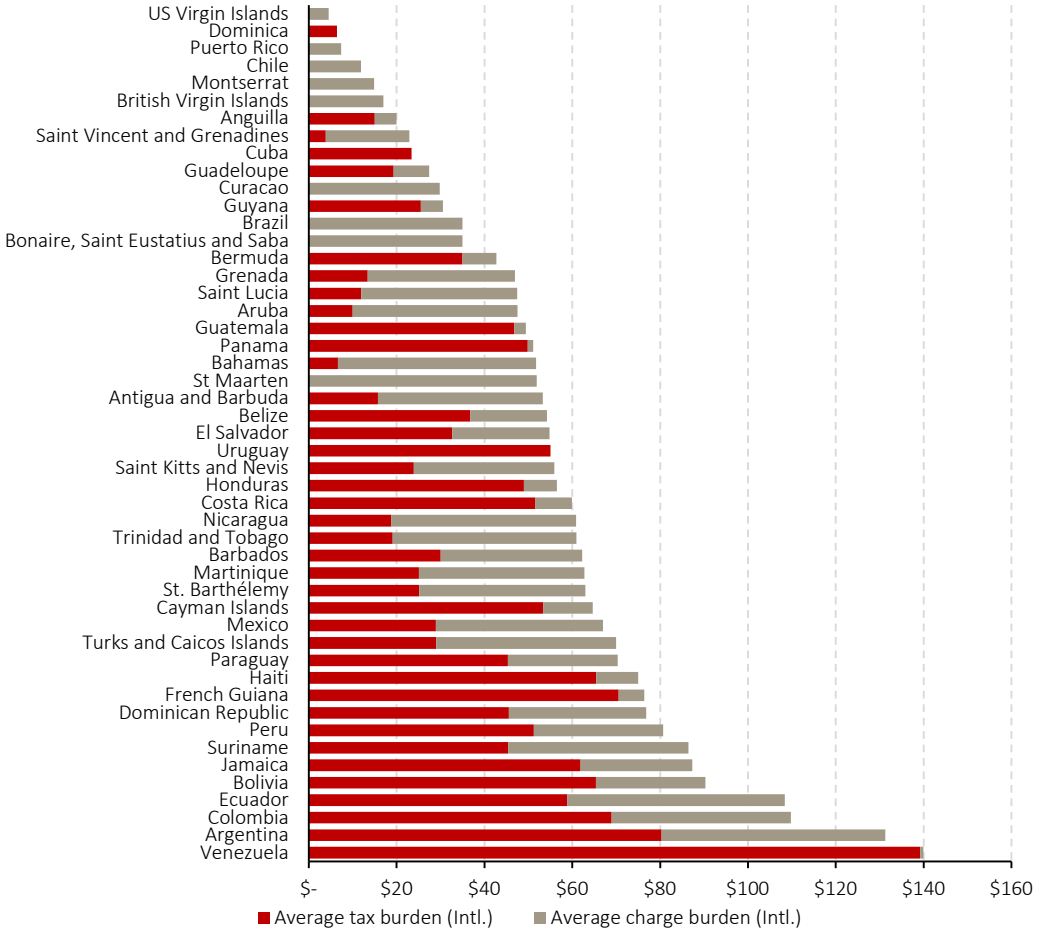
High tax burden limits the potential economic benefits of connectivity growth

However, despite the connectivity growth and the economic value attached to it, many governments in the region view air transport as a luxury for the wealthy, rather than a catalyst for economic growth. As a result, aviation has been an easy target for taxation as Figure 1.2 shows. Such taxes are not intended to cover the cost of the use of aviation system infrastructure and

services, but solely to generate general government income. For example, a number of Latin American states apply VAT and other taxes on domestic and international flights. The result is that in a significant amount of countries, the share of taxes as a percentage of ticket price is between 15 and 20 percent. In addition, passenger-related charges are particularly high in a number of countries. In many cases, a share of these charges is not intended to cover costs of aviation-related services and infrastructure, but as a means to generate additional government revenue. Finally, the global aviation industry is highly-taxed in comparison to other transport modes: airlines pay – through taxes and user charges- in full or more for their associated infrastructure costs, whereas other transport modes are frequently heavily subsidised.[1]

Governments in the region generally do not realize that taxation leads to discouraged travel, which limits connectivity. The **high tax burdens in some countries prevent them to fully unlock the economic benefits that air transport can bring in today's globalized society**.

Figure 1.2 Average passenger related tax and charge burden on international flights by country



Source: IATA TTBS, SEO Analysis

[1] IATA (2005)

Objectives of this study

IATA commissioned SEO Amsterdam Economics to prepare a study to independently quantify the economic benefits of reducing aviation taxes in Latin America and the Caribbean. **The study provides evidence on the substantial economic benefits that a removal of aviation taxes and a reduction of passenger-based charges can bring to the economies of Latin America and the Caribbean for consumers and businesses.** The study also shows that significant potential benefits of connectivity growth will be foregone for consumers and businesses if taxes remain at their current levels.

This study uses two different approaches to assess the economic impacts:

- **the consumer benefit approach** focuses on the welfare benefits of tax reduction for consumers (both private consumers and businesses) in the form of travel cost reductions and connectivity improvements, as well the additional benefits for the wider economy. A generalized travel cost model is used to estimate the consumer benefits. The approach is in line with the best-practice in the appraisal of infrastructure investments and policy measures in transport economics[2].
- **the macro-economic approach** mainly refers to GDP and jobs. Econometric estimations have been used to estimate GDP and job impacts.

Although there is some overlap between both approaches, they are different approaches, of which the results cannot be added up.

We estimate both the immediate impacts as well as the potential long-term economic impacts of reducing aviation taxes (up to 2035). We distinguish between two different scenarios.[3]

1. **'Tax Removal' scenario:** all aviation taxes are reduced to zero.
2. **'Tax Removal and Charges Reduction scenario:** all aviation taxes are removed and passenger-based charges are reduced to a reasonably lower level per sub-region.

Key results

Removing aviation taxes drives efficiency and connectivity growth to the benefit of the consumer

Removing aviation taxes and reducing passenger-based charges could deliver businesses and individual consumers in Latin America and the Caribbean 5.8 to 7.9 billion USD of immediate direct consumer benefits, compared to a 'do nothing scenario'. These direct consumer benefits 'ripple' through the rest of the economy and create wider economic benefits. **We estimate the additional wider economic benefits at 1.0 to 1.5 billion USD, depending on the scenario**.

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2 We note that this study quantifies the consumer and wider economic benefits of tax removal and charges reduction. The estimation of environmental externalities and the opportunity costs of a tax/ charges reduction (i.e. the impact of tax revenue spending in the wider economy) is outside the scope of this study).

3 Data on taxes and charges were derived from IATA's *Ticket Tax Box Service* (TTBS)

Reducing aviation taxes has longer-term benefits for passenger demand, connectivity growth and the economy. We estimate that **direct consumer benefits accumulate to 13.5 to 18.5 billion USD in 2035, creating an additional 1.5 billion to 2.2 billion USD of additional wider economic benefits, in the 'Tax Removal' scenario and 'Tax Removal and Charges Reduction' scenario respectively**. The 'Tax Removal' scenario represents a total present (discounted) benefit of 122 billion USD over the period 2014-2035. The total present (discounted) benefits of the 'Tax Removal and Charges Reduction' scenario amounts to 170 billion USD over the same period.

Total benefits (consumer benefits and wider economic benefits) consist of:

- **Lower fares** as airlines are expected to pass on tax reductions to passengers in the long term;
- **Connectivity growth** (more routes, more frequencies), resulting in more flexibility for passengers and shorter travel times;
- **Wider economic benefits**, created by agglomeration and productivity impacts, but also additional jobs created in the economy.

Depending on the scenario, immediate **consumer benefits per passenger range between 50 and 66 USD per passenger**. Benefits are higher for business (65-84 USD) than for leisure (46-61 USD) passengers.

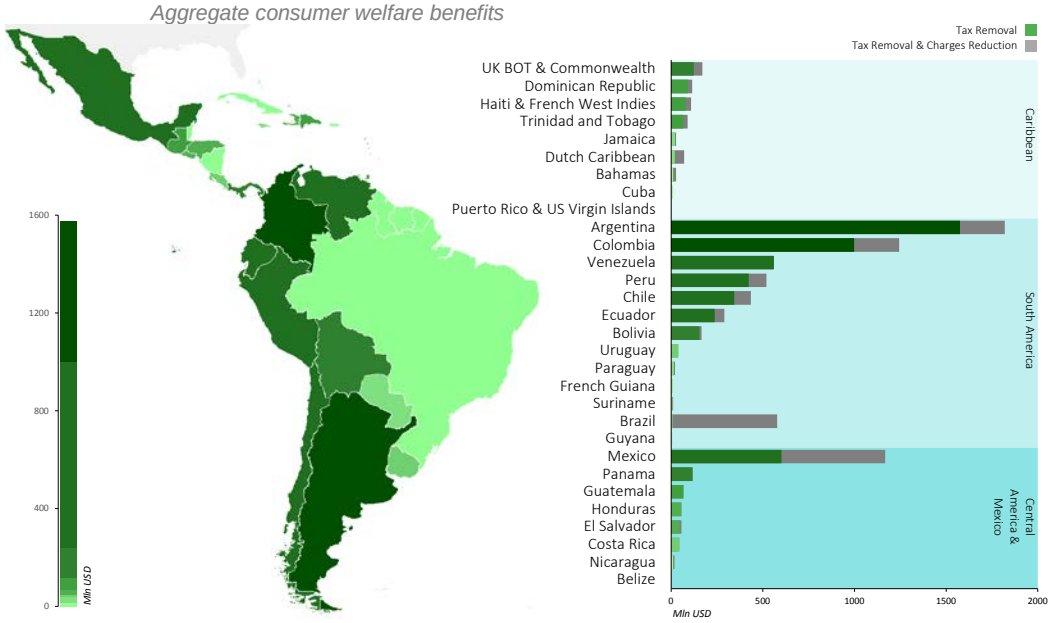
Consumer benefits per country

Consumer benefits differ substantially by country. This is due to differences in the absolute amount of the taxes and charges reductions, but also due to differences in the size of the national aviation markets and forecasted future growth.

The figure below shows the immediate direct consumer benefits of the scenarios 'Tax Removal' and 'Tax Removal and Charges Reduction' reduction at a per country basis. As far as the 'Tax Removal' scenario is concerned, consumer benefits are largest for Argentina, Colombia and Mexico. In countries that do not currently have aviation taxes (e.g. Brazil) or with small aviation markets, benefits are absent or very limited. In the scenario 'Tax Removal and Charges Reduction', benefits are largest for the same three countries.

Figure 1.3 Argentina, Colombia, Mexico and Venezuela show the highest consumer benefits of removing aviation taxes.

Aggregate consumer welfare benefits



Source: SEO NetCost

In other countries, consumer benefits are smaller in absolute terms due to the smaller sizes of their economies and aviation markets. However, the benefits on a per passenger basis are still very substantial. Countries such as Jamaica, Uruguay, Paraguay, Suriname and El Salvador would significantly benefit from charges and taxes reductions on a per passenger basis.

The macro-economic contribution of reducing aviation taxes

As far as the macro-economic contribution approach of reducing aviation taxes is concerned, we have calculated the effects of the removal of aviation taxes and reduction of passenger-based charges on GDP and employment.

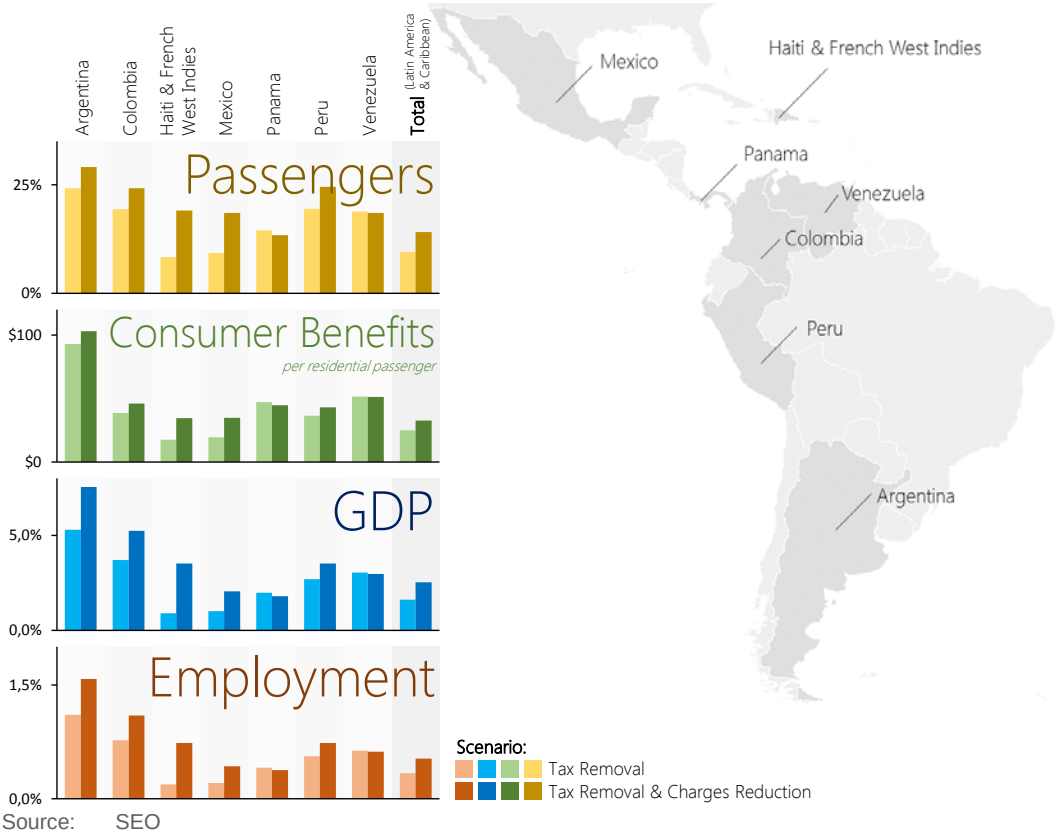
Removal of aviation taxes at the present moment will result in a total GDP impact of USD 87 billion and 912 thousand jobs. If also passenger-based charges are scaled back, this amount increases to **USD 135 billion** and **1.4 million jobs**. These figures include all GDP and employment directly and indirectly related to aviation.

Substantial economic benefits at a per country basis

Figure 1.4 shows the economic impacts for 7 focus countries and for Latin America and the Caribbean as a whole. Figure 1.4 includes countries of all sub-regions in Latin America and the Caribbean, showing that lowering and/or removing aviation taxes and charges could have beneficial effects across the continent. For other countries, removing aviation taxes and reducing passenger-related charges brings substantial economic benefits on a per passenger basis as well. Also these countries will benefit from lower taxes and charges, and therefore lower fares and better connectivity. The fact that their total economic benefit is smaller in absolute terms is largely due to the smaller size of their aviation markets.

Figure 1.4 Summary of economic benefits of a reduction of aviation charges and/or removal of aviation taxes for a sample of countries

Displayed are the immediate effects of a removal of air travel taxes and charges reduction



Source: SEO

Reducing aviation taxes and charges is key in order to enable air transport to deliver maximum value as an enabler of the Latin American and Caribbean economy. The study shows that maintaining the current high level of taxes and passenger-based charges in many countries acts as a brake on competitiveness, jobs and GDP as air connectivity fails to keep up with countries that do see aviation as a strategic priority instead of an easy source for government revenue. This would be to the detriment of consumers and businesses alike, with the impacts felt through lower trade, investment, productivity and employment.

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1 Introduction

Growth in aviation connectivity strengthens competitiveness and delivers economic growth opportunities. However, in many countries in Latin America and the Caribbean, aviation taxes limit the full economic potential of aviation connectivity growth. This study provides insight into the economic benefits of removing aviation taxes and reducing passenger-based charges in Latin America and the Caribbean.

Air transport in Latin America and the Caribbean supports 4.9 million jobs and contributes $ 153 billion USD to regional GDP.[4] Aviation facilitates global contacts, mobility and trade. It generates agglomeration economies, stimulates productivity, trade, R&D and foreign direct investment. All in all, the aviation industry contributes significantly to the economy in Latin America and the Caribbean.

Despite its economic value, many governments in the region view air transport as a luxury for the wealthy, rather than a catalyst for economic growth. As a result, aviation is an easy target for taxation. Such taxes are not intended to cover the cost of the use of aviation system infrastructure and services, but merely to generate general government income, without accounting for the negative impacts that constraining aviation demand/ connectivity has on economic growth and productivity.

For example, some Latin American states apply VAT and other taxes on domestic and international flights. Brazilian airlines currently pay some of the highest fuel charges in the world, 17 percent above the global average. Ecuador is looking into a similar pricing model that could raise fuel costs there by as much as 30 percent. Panama plans to raise air navigation charges 97 percent and Peru levies a 16 percent VAT on air traffic control charges.[5] These kind of taxes deviate from global standards, and are often in conflict with the Chicago Convention and ICAO rules.[6]

Governments in the region may not fully realize that taxation leads to discouraged travel, which limits connectivity. The high tax burdens in some countries could prevent them to fully unlock the economic benefits that air transport can bring in today's globalized society.

Against this background, this study provides insight into the economic benefits of reducing aviation taxes. More specifically, it answers the following questions:

- What is the current economic impact of the removal of aviation taxes and reduction of passenger-based charges in Latin America and the Caribbean?
- What will be the future consumer and economic benefits of the removal of aviation taxes and reduction of passenger-based charges for countries in Latin America and the Caribbean?

4 IATA News Brief: LatAM Growth Delivers Economic and Social Benefits. 7 June 2015.
5 IATA Press Release No.: 53. Enabling Aviation to Drive Growth in Latin America. 16 November 2015.
6 ICAO's Policies on Taxation in the Field of International Air Transport. Doc. 8632. Third Edition, 2000.

2 How aviation connectivity supports economic growth and competitiveness

Growth in connectivity by air brings economic benefits and strengthens the competitiveness of regions. The relationship between connectivity growth and economic growth is a two-way relationship: air travel contributes to the efficient functioning of the economy and economic growth stimulates the demand for air travel. Latin America and the Caribbean represent substantial opportunities for growth when it comes to aviation connectivity. However, in many countries in Latin America and the Caribbean, aviation taxes limit the full economic potential of connectivity that aviation helps to deliver.

2.1 Connectivity by air is key to competitiveness and growth

Aviation plays an important role in today's globalized society. The connectivity by air it generates is a key element for the competitive position of countries in Latin America and the Caribbean, its regions and cities. There is an increased understanding among policy makers about the potential benefits of aviation connectivity to the economy.

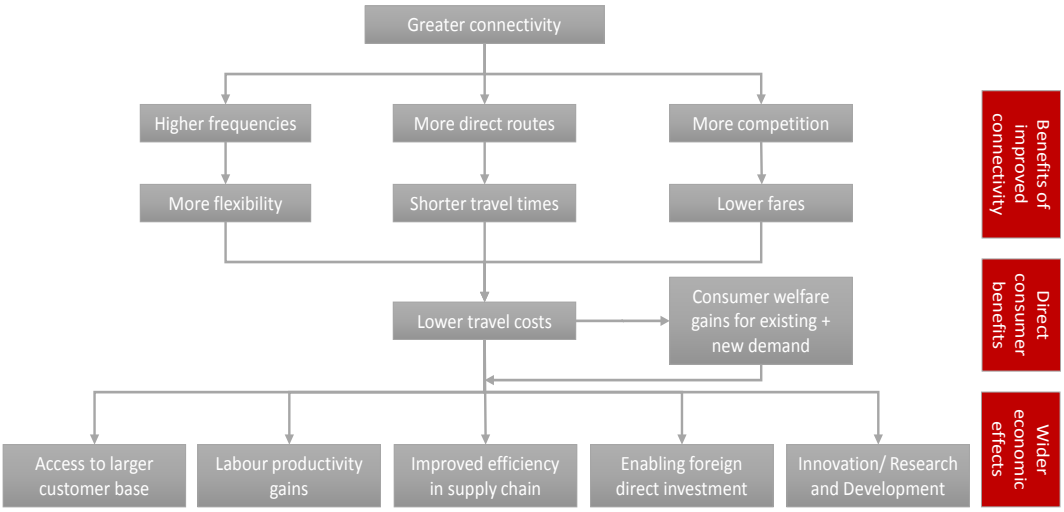
2.1.1 Consumer benefits

A superior connectivity by air performance minimizes travel costs for passengers, businesses and shippers. Growth in aviation connectivity (increase in the number of non-stop destinations and higher flight frequencies) leads to shorter and more convenient travel times, increased competition and lower fares. This translates into lower travel costs for consumers, individuals and businesses alike. These lower 'generalized' travel costs translate into a direct consumer welfare gain or 'consumer surplus'. Consumer surplus is a widely accepted way of quantifying changes in welfare from policy interventions. It is the amount consumers are willing to pay for a good or service in excess of the actual price they pay for the good or service without these interventions.

2.1.2 Wider economic benefits

These direct consumer welfare benefits of connectivity improvements 'ripple' through the rest of the economy and may result in wider economic benefits. Greater connectivity provides potential wider economic benefits in a number of different areas as Figure 2.1 shows. Some of these effects are really additional to the direct benefits (such as agglomeration effects, translating into higher labour productivity) and deliver a net welfare gain. Others are merely passed-on direct effects from aviation users to other stakeholders (such as higher company profits due to lower air fares) outside the air transport industry itself, but they do not deliver a net welfare gain.

Figure 2.1 Aviation connectivity growth results in consumer benefits and wider economic benefits



Source: SEO

Larger customer base

An improvement in connectivity levels means lower costs for businesses to access a larger customer base for their products or services. This is in particular important for high-tech and knowledge-based sectors, as well as suppliers of time sensitive goods (IATA 2007). Even in a world with alternative forms of long-distance communication, face-to-face meetings with business partners remain an important part of doing business.

Higher productivity

By expanding the customer base, air transport allows companies to exploit economies of scale and to reduce unit costs. By exposing domestic companies to increased foreign competition, it also helps to drive efficiency improvements among domestic firms in order to remain competitive. Connectivity growth can also result in a concentration of economic activities in airport regions, where companies then start to benefit from each other's presence in terms of a pooled labour market and knowledge spill overs (the so-called agglomeration effects).

Improved efficiency of the supply chain

Many industries rely on air transport to operate 'just-in-time' production. Air transport provides them with the flexibility needed to reduce costs by minimizing the need to hold stocks of supplies. The growth of air transport has contributed to the globalization and unbundling of supply chains, which have led to improved efficiency.

Enabling foreign direct investment

Access to extensive air transport links allows domestic firms to identify and manage investments in foreign-based assets and encourages foreign firms to invest in the domestic economy.

Innovation

Improved air links foster effective networking and collaboration between companies and researchers in different parts of the world. Access to a greater number of markets and exposure to foreign competition also stimulate R&D spending by companies, given the increased size of the potential market for future sales.

There is increasing evidence on the wider economic benefits of connectivity growth, both additional and non-additional. The box below provides an overview of a number of studies considering the wider economic benefits of aviation growth.

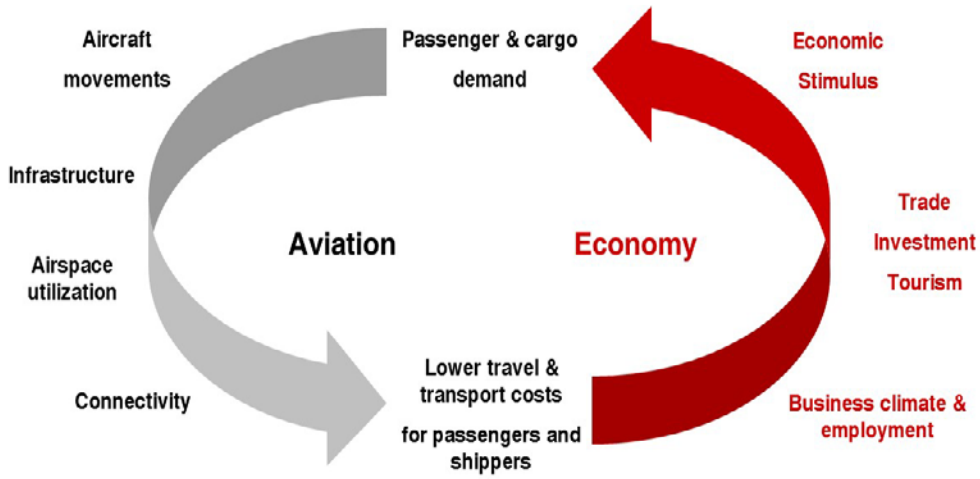
Empirical evidence on the wider economic benefits of connectivity growth

- **Headquarters**. Research of the University of Barcelona finds that a 10 percent growth in the number of intercontinental flights results in a 4 percent growth in the number of headquarters in European metropolitan areas (Bel & Fageda 2008), controlling for causality via a simultaneous equation system.
- **Productivity**. According to InterVISTAS (2015) a 10 percent growth in connectivity by air is associated with a 0.5 percent growth in GDP/capita at the national level in Europe. IATA (2007) finds that a 10 percent growth in connectivity, relative to GDP, can increase long-term productivity in terms of GDP per hour worked by 0.07 percent.
- **Foreign Direct Investment**. Opening of new routes to Italian regions is associated with increases in Foreign Direct Investments in the years after the route opening (Bannò & Redondi 2014). For the UK, a 10 percent increase in seat capacity is associated with a 1.9 percent increase in FDI outflows and 4.7 percent FDI inflows (PWC 2014).
- **Trade**. Belenkiy & Riker (2012) find that each additional business trip in the United States increases U.S. commodity exports to the visited country by almost 37,000 USD. For the UK, a 10 percent increase in seat capacity is associated with a 1.7 percent increase in UK goods imports and a 3.3 percent in goods exports (PWC 2014).
- **Tourism**. For the UK, a 10 percent increase in seat capacity results in a 4 percent increase in inbound tourists and a 3 percent increase in outbound tourists (PWC 2014).
- **Innovation**. According to the work of Hovhannisyan & Keller (2014), a 10 percent increase in business travel leads to an increase in patenting by about 0.2 percent, based on research in 37 industries in 34 countries, covering outward business travel from the United States. Baruffaldi (2015) finds that firms located in German regions where airline liberalization induced a higher level of interregional knowledge integration, innovative productivity increased significantly.

2.1.3 Virtuous circle

The relationship between connectivity and economic growth is a two-way relationship. Air travel contributes to the efficient functioning of the economy and economic growth again stimulates the demand for air travel. In fact, there is a 'virtuous circle' between connectivity growth and economic growth.

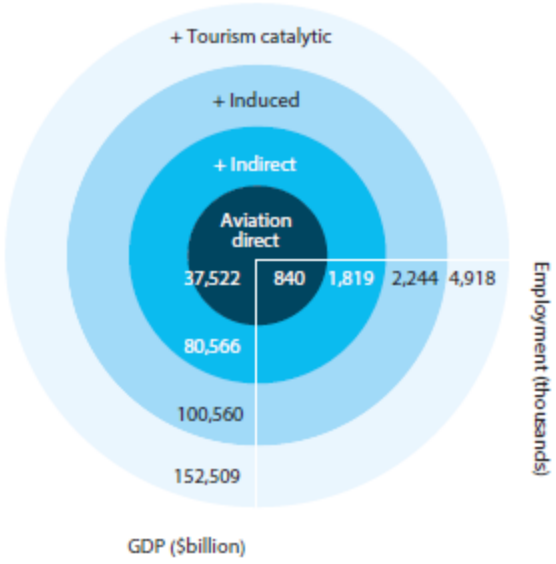
Figure 2.2 Virtuous circle of connectivity growth and economic growth



2.1.4 Jobs and GDP

Apart from the welfare benefits of connectivity growth, airports and civil airspace users support many jobs in the economies of Latin America and the Caribbean. According to a study by ATAG (ATAG 2014), almost 4.9 million jobs and 153 billion USD of GDP are currently directly or indirectly related to aviation. 840,000 jobs and over 80 billion USD of GDP are directly related to aviation, which is the employment and GDP associated with the operation and management of activities at the airports, including the airlines, ATC, ground handlers, security, maintenance, immigration and customs. The remainder of the impacts are indirect (generated by downstream industries that support and supply the activities at the airport), induced (economic activity and spending generated by employees of firms directly or indirectly related to the airport) and catalytic (facilitation of business of other sectors of the economy due to aviation).

Figure 2.3 Total job and GDP contribution of aviation in Latin America and the Caribbean



Source: ATAG 2014

2.2 Connectivity in Latin America: substantial opportunities for growth

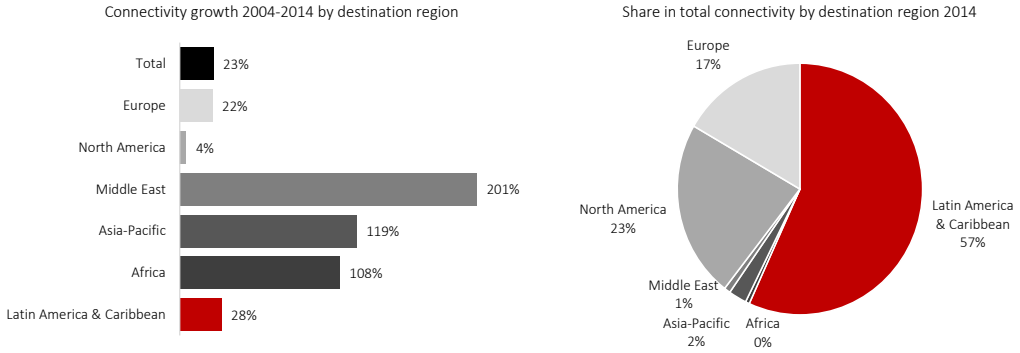
Latin America and the Caribbean represent substantial opportunities for growth when it comes to aviation connectivity. Figure 2.4 shows the result of a connectivity analysis for Latin America and the Caribbean using SEO's NetScan connectivity model.

2.2.1 Connectivity profile

By far the largest share of total connectivity (direct, nonstop and indirect via other hubs) at Latin American airports is provided by flights within Latin America and the Caribbean region. North America and Europe provide 23 percent and 17 percent respectively, while the Middle East, Asia-Pacific and Africa combined account for less than 5 percent in 2014. Connectivity to the Middle

East tripled in the period between 2004 and 2014, while Asia-Pacific and Africa more than doubled. Connectivity within Latin America and the Caribbean and connectivity to Europe increased by 28 percent and 23 percent respectively, while North America grew with just 4 percent, making it the slowest grower of all the world regions.

Figure 2.4 Direct, indirect and airport connectivity growth at airports in Latin America and the Caribbean by world destination region, 2004-2014



Source: SEO NetScan
Note: Connectivity is defined as the number of direct and indirect connections, weighted for the quality of those connections. See for example Burghouwt et al. (2009).

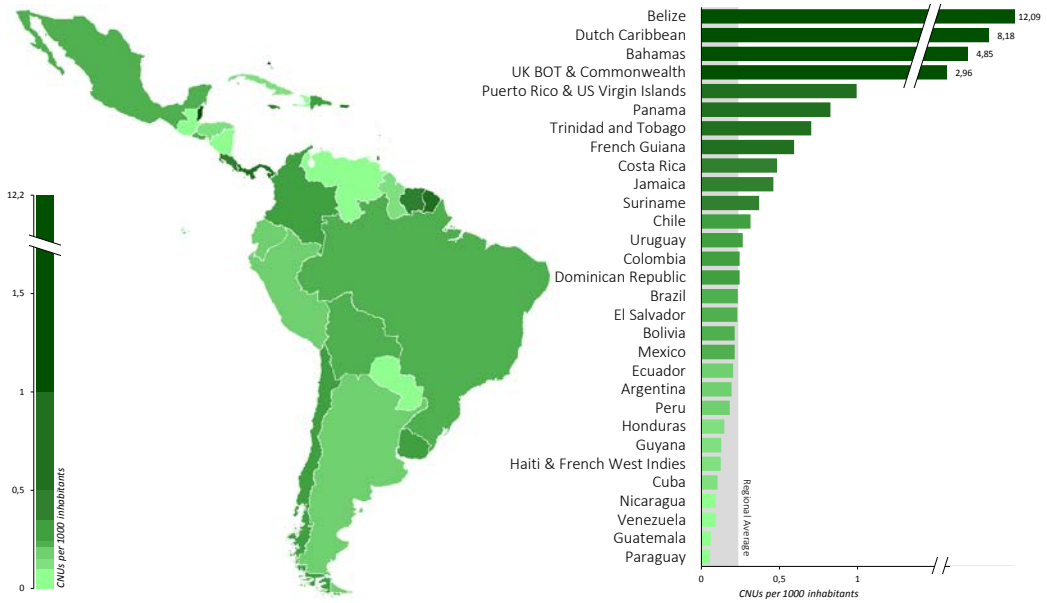
2.2.2 Connectivity per capita

Unsurprisingly, when looking at connectivity per capita, the countries with a strong tourism industry and small population come out on top (Figure 2.5). Belize, the Dutch Caribbean, the Bahamas and UK British Overseas Territories & Commonwealth all had figures close to or above 3 connectivity units (CNUs)[7] per thousand inhabitants. Furthermore, Puerto Rico & US Virgin Islands, Panama, Trinidad and Tobago, French Guiana, Costa Rica, Jamaica and Suriname were all at least 50 percent above the continental average of 0.24 CNUs per thousand inhabitants. From the larger countries, Chile shows particularly high connectivity per capita levels with 0.31 CNUs per thousand inhabitants. The countries with relatively low levels of connectivity per capita in 2014 were Nicaragua, Venezuela, French Guiana, Guatemala and Paraguay all with less than 0.1 CNUs per thousand inhabitants.

7 Connectivity is defined as the number of direct and indirect connections, weighted for the quality of those connections in terms of detour and transfer time. See for example Burghouwt et al. (2009).

Figure 2.5 Connectivity per capita is particularly high in the small islands of the Caribbean

Total direct and indirect connectivity per 1000 inhabitants in 2014 by country



Source: SEO NetScan

Note: Connectivity is defined as the number of direct and indirect connections, weighted for the quality of those connections. Connectivity is expressed in CNUs (Connectivity Units). See for example Burghouwt et al. (2009).

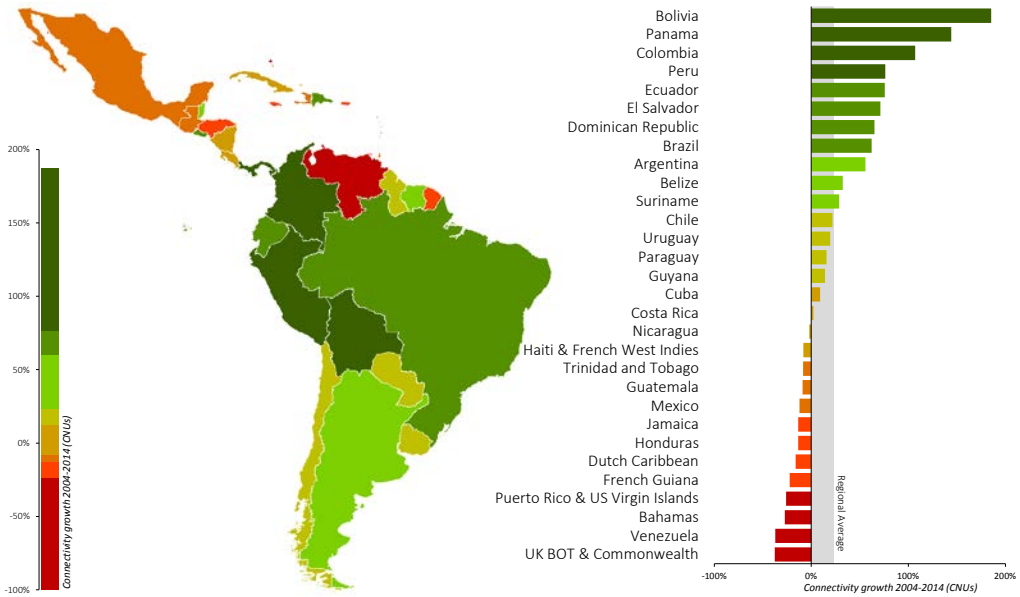
2.2.3 Changes in connectivity performance

Figure 2.6 displays the development in total connectivity in Latin America and the Caribbean between 2004 and 2014. Within the region, Bolivia, Panama and Colombia showed by far the highest aviation connectivity growth figures, with 185 percent, 144 percent and 107 percent respectively. Other countries that outperformed the regional average of 23 percent include Peru, Ecuador, El Salvador, the Dominican Republic, Brazil, Argentina and Belize.

However, 13 out of the 31 analyzed territories show a decline in connectivity. Perhaps most alarming is the case of Venezuela, where connectivity decreased more than 35 percent in only ten years. A reason for the sharp decline is the strong decline in economic growth, partly driven by the contraction in international oil prices and a strongly expansive monetary policy, which drove up inflation. Instead of viewing aviation as a strategic asset, the government apparently considers aviation as a source of revenue, resulting in high unit taxes and further declines in aviation connectivity.

Figure 2.6 Connectivity growth particularly high in Bolivia, Colombia and Panama

Total direct and indirect connectivity growth 2004-2014 by country



Source: SEO NetScan

Note: Connectivity is defined as the number of direct and indirect connections, weighted for the quality of those connections. Connectivity is expressed in CNUs (Connectivity Units). See for example Burghouwt et al. (2009).

2.3 Aviation taxes limit full economic potential of aviation connectivity

However, in many countries in Latin America and the Caribbean, aviation taxes limit the full economic potential of connectivity that aviation helps to deliver. Although a full analysis of the explanation of connectivity growth differentials in Latin America and the Caribbean is outside the scope of this study, the modest overall 2004-2014 connectivity growth is likely to have been influenced by the often burdensome aviation taxation regimes in various countries.

Despite its economic value, many governments in the region view air transport as a luxury for the wealthy, rather than a catalyst for economic growth. As a result, aviation is an easy target for taxation. Such taxes are not intended to cover the cost of the use of aviation system infrastructure and services, but solely to generate general government income. Governments in the region generally do not consider that taxation leads to discouraged travel, which limits connectivity. In addition, passenger-related charges are particularly high in a number of countries. In many cases, a share of these charges is not intended to cover costs of aviation-related services and infrastructure, but as a means to generate additional government revenue. They are in fact 'hidden taxes'. The high tax burdens in a number of countries in the region will prevent them from fully unlocking the economic benefits that air transport can bring in today's globalized society.

In the next chapter, we first discuss how aviation taxes work out on the economy and then highlight a number of experiences with aviation taxes throughout the world. We then survey the current

aviation taxes in Latin America and the Caribbean and derive an average tax rate per country in Chapter 4.

3 How aviation taxes limit connectivity and economic growth

Many countries in Latin America and the Caribbean levy aviation taxes. Studies on the impact of aviation taxes often show that the net economic impact of such taxes for the national economy is negative. First of all, government revenues from the tax are much lower than expected due to passenger demand reductions and the decrease in other government revenue streams, which are indirectly related to aviation (VAT, profit-based taxes). Secondly, the costs for the broader economy are often higher relative to the income generated for the government. A number of case studies highlights the impacts of aviation taxes in various countries.

3.1 Aviation taxes

Many countries in Latin America and the Caribbean levy aviation taxes. In most cases, air travel taxes are rates per departing passenger, differentiated by distance category and travel class. For passengers travelling longer distances and passengers travelling in premium classes, airlines may pay a higher air travel tax. The same holds for domestic versus international passengers.

Transfer and transit passengers are mostly exempted from paying taxes, given their high (cross-) price elasticity and footlooseness. Taxes can be either a flat rate per flight and travel category or a percentage of the ticket price, differentiated by category. As we will see in Chapter 4, this is also the case in Latin America and the Caribbean.

In practice, taxes and charges cannot always be clearly distinguished. Some countries may not have official aviation taxes, but only passenger-based charges, which are higher than the underlying costs they are intended to cover. In such cases, the charge may party be a 'real' charge and partly a 'hidden' tax. The existence of the 'hidden' taxes is the reason that in this study we also consider a scenario in which passenger-based charges in Latin America and the Caribbean are reduced.

In order to create social acceptance, air travel taxes are often labelled as environmental measures to reduce carbon emissions. They may also be presented as charges to cover airport (service) expense, but may actually be (partly) a 'hidden' tax when the amounts collected are well above the underlying costs. In other words, air travel taxes are often revenue-raising measures to finance the general funds of the central government, justified by other arguments.

Finally, we note that from a global perspective the aviation industry is highly-taxed in comparison to other transport modes: airlines pay –through taxes and user charges- in full or more for their associated infrastructure costs, whereas other transport modes are frequently heavily subsidised.[8]

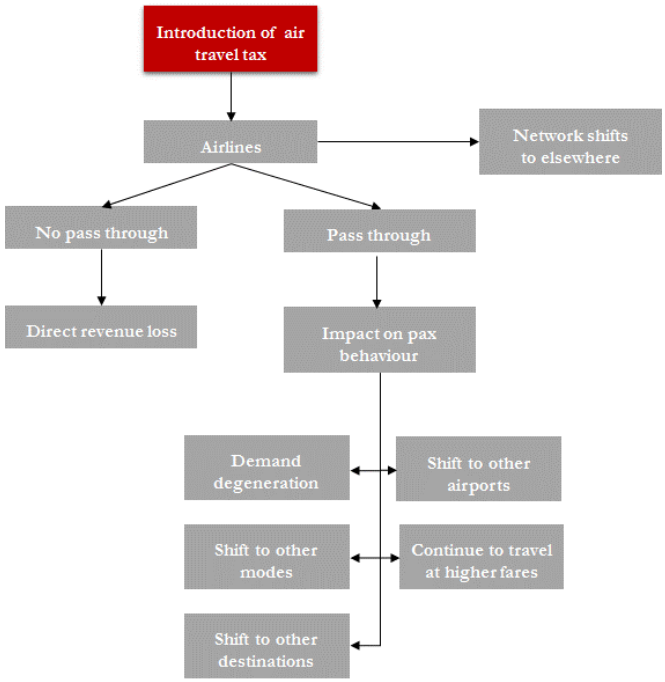
[8] IATA (2005)

3.2 The different impacts of aviation taxes

What is the impact of the introduction of an aviation tax? In general, the effects of aviation taxes can be broken down into a number of elements:

1. The tax collecting authority will impose an air travel tax, whereby airlines bear full responsibility for levying, collecting and remitting the tax. Overall, this results in an increase in the cost of air travel.
2. The airline may decide to 'absorb' the tax and reduce the market price of air travel to ensure the total price paid by passengers remains the same. As a result, airline profits decrease.
3. Lower profits can induce airlines to adjust their networks, for example by cutting frequencies or cancelling routes altogether. Lower profit expectations may also lead to foregone connectivity opportunities: airlines do not start new routes or do not increase frequencies due to the higher cost levels.
4. In the longer term, it is generally assumed that airlines will pass on higher costs to the airline passengers, influencing passenger behaviour. Passenger can for example choose to:
   - Cancel their travel plans (market degeneration);
   - Choose to travel with another travel mode (car, train, ferry);
   - Travel from another (foreign) airport;
   - Travel to another (tourist) destination;
   - Continue to travel as they did before, but at a higher cost.
5. In general, taxation leads to demand reduction, resulting in fewer passengers. In addition, fewer passengers and revenues may also force airlines to decrease frequencies, cancel routes altogether and grow their network at other airports. Tax introductions can therefore induce connectivity losses and foregone growth opportunities.
6. Finally, the introduction of air travel taxes has consequences for the government, travellers and aviation-related sectors in the economy:
   - Tax income for the government;
   - Unemployment increases, related to the reduction in traffic, leading to higher unemployment expenses for governments;
   - Less government revenues from VAT and profit-based taxes;
   - Higher costs (in time and money) for travellers, constituting a negative welfare impact;
   - Negative impacts for aviation-related businesses, such as the tourism industry.

Figure 3.1 Aviation taxes have negative impacts on airlines and passengers



Source: SEO

Level of pass-through by airlines

The extent to which airlines pass through cost increases to their passengers is an important factor for all subsequent aviation tax effects. In reality, airlines will apply different pass-through strategies. Koopmans and Lieshout (2016) conclude that the pass-through level strongly depends on the cost change and market conditions. In monopolistic markets, a large part of the price change may be passed through, whereas in more competitive situations, sector-wide cost changes may also be passed through to a large extent, but not fully. In competitive situations where cost changes only affect one competitor, pass through levels are likely to be much smaller. The authors state that although a 100 percent pass-through is indeed likely under perfect competition, most aviation markets are not perfectly competitive.

On the longer term, it is generally assumed in studies that airlines pass on cost increases/decreases to their passengers in the form of higher/lower fares, an assumption that will also be followed in this study.

3.2.1 Taxes result in demand reduction

Assuming a certain level of pass-through by airlines to passengers, demand reduction will occur, especially at the low end of the market, where price sensitivity is highest. Price sensitivity is highest among leisure passengers. The per passenger impact in this segment is likely to be highest.

3.2.2 Taxes may cause modal shift

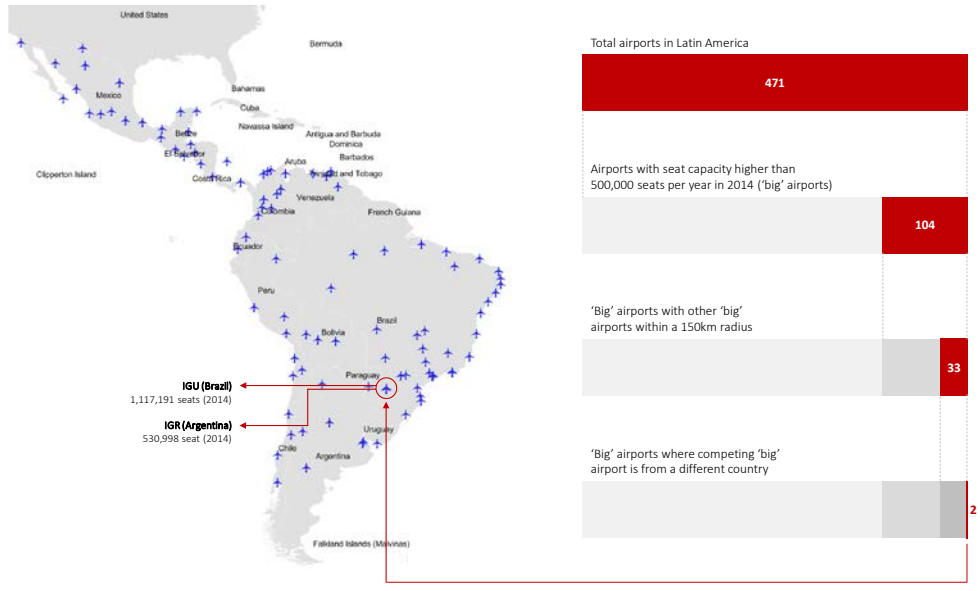
In short haul markets, some of the passengers who face higher ticket prices will decide to travel by a different transport mode. Passenger travelling within the Caribbean, for example, may in some cases have the opportunity to travel by ferry instead of by plane. On shorter distances, travelling by car or bus may become more attractive when the costs of air travel rise.

3.2.3 Taxes may lead to increased use of foreign airports

Air travel taxes may induce demand shifts to foreign airports. Such passenger 'leakage' effects can be very profound in countries that face competition from border airports in neighbouring countries. As a result of the introduction of the Dutch air travel tax for example, almost one million passengers moved from Dutch airports to border airports in Germany and Belgium, such as Weeze, Düsseldorf and Brussels.

However, in case of island airports and airports located at considerable distance from foreign airports, such 'leakage' is less likely. Because of the geography in Latin America and the Caribbean and the spatial distribution of airports, traffic 'leakage' to foreign airports is not a factor of major importance. Figure 3.2 shows that from the 471 airports in Latin America that had scheduled service in 2014, 104 of them could be classified as medium/large airports with more than 500,000 seats per annum. Only 33 of them had another medium/large airports with a 150km radius, of which 2 were foreign airports. Yet, the overlap in the networks of these 2 airports is limited. This means that foreign airport demand leakage is not a factor of substantial importance in the region under consideration.

Figure 3.2 Demand 'leakage' to foreign airports due to taxation not a factor of major importance in Latin America



Source: OAG; analysis SEO

Hub airports

In most cases, air travel taxes do not apply to transfer passengers. If they are introduced in the transfer segment at hub airports and passed through by airlines to their passengers, impacts on passenger demand are generally very substantial: the number of travel options in many transfer markets is large, passengers are very price sensitive and cross-price elasticities are often -3 or lower.

3.2.4 Destination shift and loss of tourism market share

In typical tourism markets such as the Caribbean, the relevant market often does not constitute the narrow passenger market but the broader holiday market. Hence, price increases due to the introduction or changes in aviation taxes may lead to substitution of one tourism destination by another. Studies have revealed that tourism competitiveness is sensitive to price changes (see e.g. Dwyer & Forsyth 2011)

3.2.5 Network changes

As a result of the introduction of taxes, airlines may adjust their networks. In particular with regard to the airports served and the level of service (frequency). Low-cost carriers in particular, being footloose, are able to move operations from airports that face the air travel tax to airports abroad without the tax very quickly. Obviously, large network carriers are more captive: they are tied to their respective hub airports and will not be able to move (a substantial part of) their network to other airports. In addition, airlines will try to adapt to demand changes as a result of price changes. This implies that airlines may cut back frequencies at routes that face substantially declining traffic numbers or profit levels, resulting from the introduction of an air travel tax.

3.2.6 Second order impacts of network adjustments

Network changes can induce second order impacts. When airlines cut back on their route network as a result of taxes, connectivity at the affected airports decreases. This will affect passenger behaviour and may induce additional decreases in passenger numbers, on top of the first order impacts of passenger demand.

3.2.7 Impact on the economy

Going back to our discussion on the economic value of connectivity, implementation or increases in aviation taxes will have a range of different impacts. Increasing or implementing aviation taxes will:

- Increase airfares for passengers when airlines pass through cost increases to their customers. These higher travel costs constitute a direct consumer welfare loss, which 'ripples' through the rest of the economy;
- Higher cost for air travel will lead to demand degeneration: less people travel. In addition, demand reductions may also force airlines to close routes or reduce frequencies, leading to lower connectivity levels. Lower connectivity levels in itself will increase travel time cost for passengers, additional passenger demand losses and additional consumer welfare losses;
- Lower traffic throughput and lower connectivity may have macro-economic consequences at the country and regional levels. This includes reductions in (regional) employment, reductions in the economic contribution of aviation to GDP and a less attractive business climate (foreign direct investment, tourism, trade, R&D). In addition, labour productivity may be negatively affected;
- Decrease in government revenues from sources such as VAT and corporation tax and an increase in government expenditure on items such as social security.

Net economic impact of taxes often negative

A number of studies on the impact of aviation taxes show that the net economic impact of such taxes for the national economy is often negative. First of all, government revenues from the tax are much lower than expected due to passenger demand reductions and the decrease in other government revenue streams, which are indirectly related to aviation (VAT, profit tax). Secondly, the costs for the broader economy are often higher than the income generated for the government.

3.3 Aviation tax case studies: Latin America

Well-researched experiences with aviation taxes in various countries show that aviation taxes have a substantial downward impact on passenger numbers, constrain connectivity growth and result in foregone economic benefits to the country in which the tax is applied.

3.3.1 Impact of proposed international transfer passenger charge in Peru

In 2013, the Peruvian government announced that it might allow Lima Airport Partner to introduce a charge on transfer passengers, as to finance airport expansion. According to IATA (2013b), the charge would entail a $ 31 one-way charge and a $ 62 return charge. This would constitute a 5 percent increase on an average return trip via Peru. IATA estimated the impact of such a transfer passenger charge on Jorge Chávez Airport in Lima, one of the major connecting points in Latin America.

The transfer market is generally very price sensitive and footloose, as many close substitutes exist and a large part of the market consists of price sensitive (leisure/VFR) passengers. Hence, substantial impacts on transfer passenger demand are to be expected. IATA (2013b) estimated the decrease in transfer passenger demand in the range of 15-20 percent, assuming a transfer price elasticity of -3 to -4. This equals a fall of 190,000 to 200,000 in international transfer passengers.

The fall in transfer passengers could make the various routes from the airport unprofitable for airlines to operate, forcing their closure. This would negatively affect Peru's connectivity to international markets. IATA estimated the resulting GDP decrease for Peru at $ -17 to $ -23 million, the resulting jobs losses at -1,168 to -1,558 jobs and the reduction in annual contribution to public finances to $ -14 to $ -18 million. The latter would cut the expected revenues of the charge by half.

3.3.2 Impact of proposed tax on foreign visitors to Chile

An aviation tax proposal for Chile was introduced. The tax proposal entailed a tax on foreign visitors of $ 20 per arrival. IATA (2013c) estimated that the tax would result in a drop of 22,000 foreign visitor arrivals by air, or a reduction of 2 percent. The reduction was estimated to result in $ 37 million GDP reduction, a reduction of 1,000 jobs and a reduction in annual contribution to public finances of $ 8 million.

The tax proposal was eventually dropped in 2013. The negative economic impacts associated with the proposed tax in Chile proved to outweigh the benefits from a government revenue perspective and was ultimately not implemented.

3.4 Aviation tax case studies: Europe

3.4.1 UK Air Passenger Duty

The UK Air Passenger Duty (ADP) has been in place since 1994 (KiM 2011) as a flat rate per passenger of £ 5 and £ 10 depending on the class of seat purchased. Since 1994, the structure of the tax has been reformed and the APD has increased. As of 1 April 2015, the APD was between £ 13 and £ 142 per passenger, depending on distance band and class of travel.

A study by PWC (2015)[9] found that abolition of the tax would generate a positive stimulus to the UK economy of 0.5 percent in the first year. PWC expects the economy to be £ 18 GBP billion larger than would be the case with the APD. Over time, the benefits of the APD abolition dissipate but still generate a 0.1 percent long-term gain on GDP. APD abolition would also generate 61,000 additional jobs between 2015 and 2020. PWC also estimated that the indirect tax benefits of APD abolition (due to income tax, corporation tax etc.) would outweigh the decreased APD income for the government.

A study by Oxford Economics (2012) for the World Travel and Tourism Council reports that abolition of the APD at that time would result in an increase of up to £ 4.2 billion in GDP and the creation of 91,000 jobs.

3.4.2 Dutch air passenger tax

On 1 July 2008, the Dutch government implemented the air passenger tax at Dutch airports, as one of the instruments for 'greening' the tax system. The tax entailed a fee of € 11.25 for departing passengers from Dutch airports to European destinations and a fee of € 45 for departing passengers from Dutch airports to intercontinental destinations (SEO 2009). Transfer passengers were exempted from the air passenger tax. Tax revenue would not be used for the aviation industry itself.

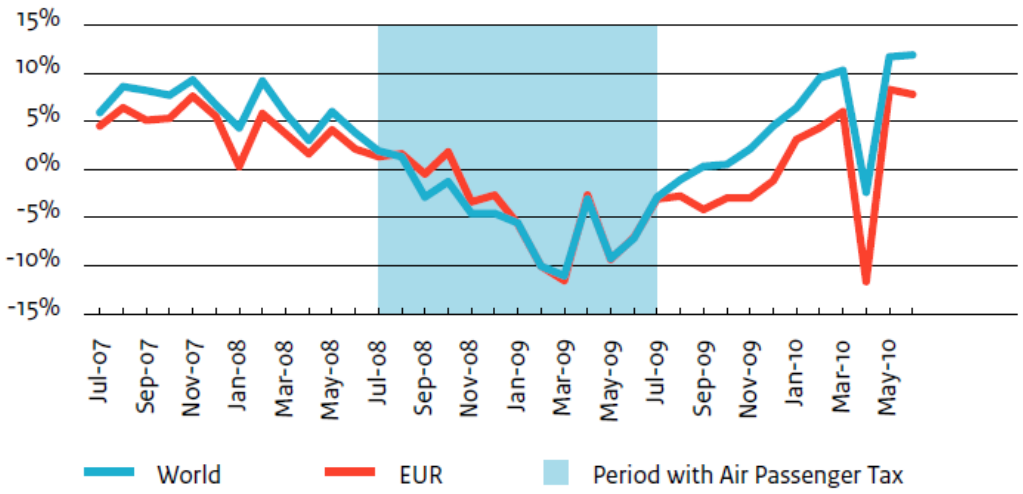
The air passenger tax had been subject to an impact assessment, which indicated that the number of air passengers would drop by 8 percent to 10 percent (Significance & SEO 2007). When the tax was actually implemented, the number of passengers from Dutch airports did indeed decrease. The impact was further accentuated by the global economic crisis. As part of the economic recovery plan of the Dutch government, the air passenger tax was set to zero as per 1 July 2009, and abolished on 1 January 2010.

Immediately following the introduction of the tax, the number of passengers departing from Amsterdam Airport Schiphol decreased, whereas the number of transfer passengers continued to increase. The decrease cannot be fully attributed to the tax, as the economic crisis started around the same time, which also had a downward impact on the number of passengers. In addition, already before the introduction, Dutch air passengers had started to increasingly use German and Belgian airports because of the supply of low-cost flights at border airports such as Dusseldorf Weeze and Charleroi. A conservative estimate by the KiM Netherlands Institute for Transport

[9] The PWC 2015 study is an update of its 2013 study.

Policy Analysis (KiM 2011) showed that the air travel tax caused a decrease of around 2 million passengers from Amsterdam Airport Schiphol.

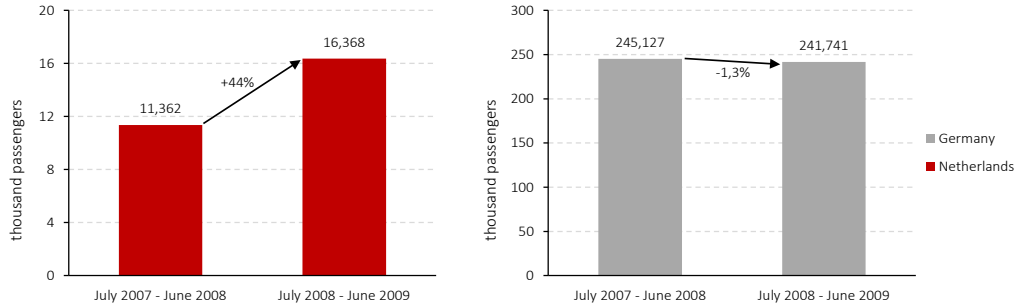
Figure 3.3 Introduction of the Dutch air passenger tax resulted in a strong decrease in demand



Source: KiM 2011, p.38

Figure 3.4 illustrates the impact following the introduction of the Dutch air travel tax, the number of tickets from Düsseldorf to the US increased considerably for point of sale Netherlands, while it remained fairly stable for point-of-sale Germany.

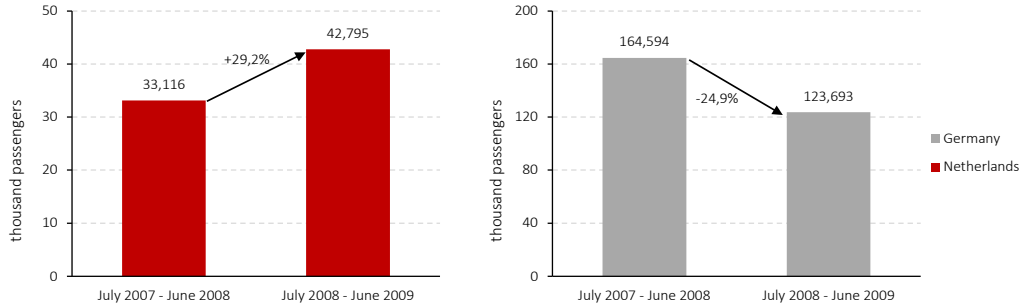
Figure 3.4 Development of the number of passengers from Düsseldorf to the US, point-of-sale Netherlands (left) and Germany (right)



Source: SEO & DLR (2010)

The same holds true for the Dusseldorf to Asia market (Figure 3.5): the Dutch air travel tax stimulated Dutch consumers to travel by car or train to a German airport and catch their flight there in order to avoid paying taxes. On the same routes, the number of German passengers decreased.

Figure 3.5 Development of the number of passengers from Düsseldorf to Asia, point-of-sale Netherlands (left) and Germany (right)



Source: SEO & DLR (2010)

The KiM-study highlights the fact that the negative impact of an air travel tax is not only due to the resulting increase in airlines' air fares impacting passenger behaviour, but also due to the publicity given to the tax. The huge publicity the tourism and airline industry raised to highlight the potential negative economic effects of the air passenger tax, substantially increased awareness of Dutch consumers to use foreign airports where the air travel tax was not applicable. In addition, KiM reports that –although the air passenger tax has been abolished - it has had structural effects on passenger behaviour: once passengers have a good experience using foreign airport, they are more likely to use them again in the future.

Economic impact of the Dutch air passenger tax

The Dutch government aimed to generate € 350 million annually with the introduction of the air passenger tax. The tax was estimated to result in a loss of 8-10 percent of passenger demand, which was considered to be acceptable, taking into account the air travel growth in the years before the introduction.

However, the reality was different. A study on the economic impact of the Dutch air passenger tax (SEO 2009) showed that the tax resulted in:

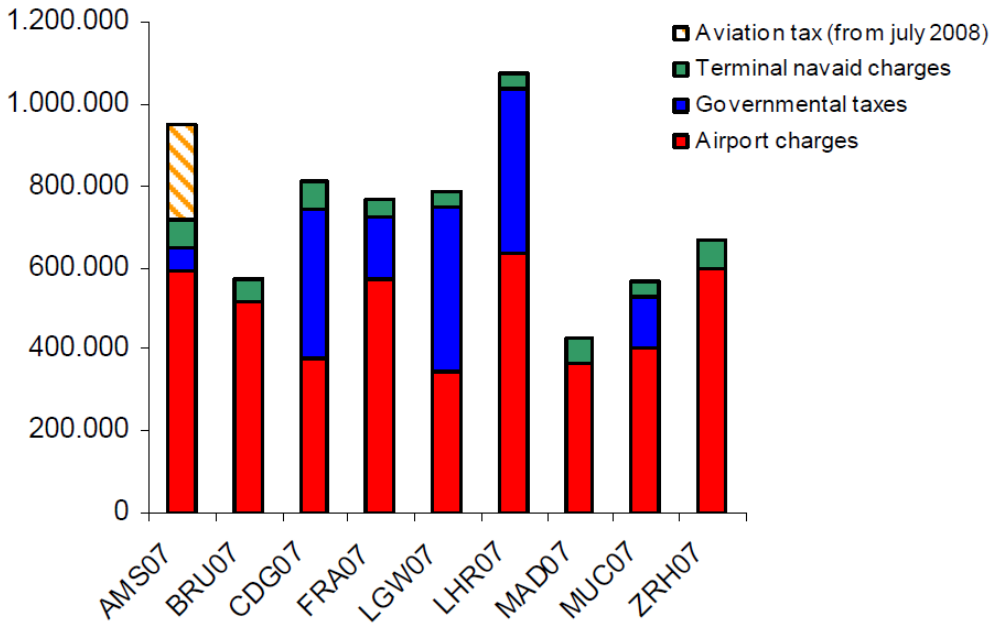
- € 90 million lower aeronautical and non-aeronautical revenues for Dutch airports;
- A revenue decrease of € 940 million for airlines using Dutch airports;
- € 83 million lower revenues from inbound tourism to the Netherlands;
- € 120-€ 300 million lower revenues for travel agents/organization regarding outbound leisure traffic;
- In sum, the study estimated a loss of revenue for different stakeholders of € 1.2 to € 1.3 billion euro.

At the same time, the revenue for the Dutch government was much lower than expected:

- Due to the decrease in air travel demand from Dutch airports, revenues accounted for € 260 million instead of € 350 million;
- Lower employment levels in the short term, resulting in social security expenses of € 100 to € 200 million.

Finally, the air passenger tax substantially affected the competitive position of Amsterdam Airport Schiphol in comparison to its European competitors in terms of visit costs, as the figure below shows.

Figure 3.6 Visit costs at a selection of large European airports, including the impact of the Dutch air passenger tax



Source: SEO (2009)

3.4.3 German air travel tax

The German federal government decided to implement an air travel tax for passengers departing from German airports as of 1 January 2011, the 'Luftverkehrssteuer', regardless of the nationality of the carrier (Steppler 2011). Initially, the tax was € 8 for European flights and € 25 for flights between 2,500 and 6,000 kilometres and € 45 for flights of more than 6,000 kilometres. The tax applied to local origin-destination passengers, but not to transfer passengers or freight shipments.

A study on the potential impact of the German air travel tax (SEO & DLR 2010) revealed that the tax would reduce the number of passengers by 5 million, of which 1.8 million would depart from non-German airports. Using input-output modelling, job losses in Germany were estimated at 13,000. The study also estimated that half of the gross income for the government of € 1 billion would be lost as a result of high unemployment compensations, lower taxes on profits and turnover. IATA (2014) estimated that the immediate annual impact of removing the German air travel tax would amount to € 1.2 billion GDP increase, 19,800 jobs and € 1,552 million of consumer benefits to travellers. Intraplan (2012) found that the German air travel tax resulted in a decrease of 1.8 million passengers in 2011, € 740 million lower airline revenues, € 170 million lower airport revenues and € 230 million lower tourism revenues.

In contrast to the Dutch air passenger tax and despite substantial opposition, the German air travel tax is still in place.

3.4.4 Austrian Air Transport Levy

Austria, following the German model, decided to implement an air passenger tax as of 1 April 2011 (Air Transport Levy). Every aircraft owner is required to pay an air transport levy to the competent tax office in Austria for passengers departing from Austrian airports, unless an exemption from liability for the Levy applies. For example, an exemption applies to transit and transfer passengers. The Levy entails € 7 for short haul flights, € 15 for medium haul flights and € 35 for long haul flights.[10]

An evaluation of the impact of the Austrian Air Transport Levy commissioned by the Austrian Finance Ministry BMF concluded that the number of passengers travelling from Austrian airports was 30.000 lower than would have been the case without the tax. The study concludes that it is unlikely, given the limited passenger decrease, that the tax has had a large negative impact on the Austrian economy (IHS 2012).

Aviation and tourism stakeholders[11] heavily criticized the IHS study, commissioned by the collecting agent of the Levy.[12] In addition, they point to the study by Oxford Economics (2012), which estimates that abolishing the Levy would result in 1.1 million additional passengers for Austria, 3,360 additional jobs and € 96.5 million additional GDP contribution.

3.4.5 Irish air travel tax

The Irish government introduced the Air Travel Tax (ATT) on 30 March 2009. The tax applied to all flights out of Ireland. Initially, the ATT entailed a tax of € 10 per passenger on all flights from Irish airports to airports, which were situated more than 300 kilometres from Dublin. For shorter flights, a rate of € 2 applied. Transfer passengers were excluded from the tax. From March 2011 on, the ATT was changed into a flat rate of € 3. After heavy opposition by airlines and tourism industry, the tax was eventually abolished in April 2014.

A study on the impacts of the initially introduced € 10/€ 2 tax (SEO 2009c) revealed that the Irish government expected the total revenue from the ATT to be around € 130 million per annum. However, due to reduction in aviation demand and shifts in supply, this was calculated to range between € 124 million and € 188 million due to the reduction in aviation demand between 0.5 and 1.2 million departing passengers. In addition, in the first year after the introduction of the tax, airlines, airports and the tourist sector faced revenue losses ranging between € 210 and € 465 million, depending on the elasticities assumed. Furthermore, the study estimated a direct loss of jobs of 2,000- 3,000 jobs at airports, airlines and the tourism industry. Finally, the study highlights the fact that the consequences of the ATT would also result in a reduction of other government revenue sources, most notably the revenues from personal income tax (and higher unemployment costs), revenues from corporate tax and revenues from sales tax. The study provides a rough estimate of the decreased government revenues of € 50 million.

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10 Federal Act Introducing and Air Transport Levy (Air Transport Levy Act).

11 https://www.wko.at/Content.Node/branchen/w/TransportVerkehr/AutobusLuftfahrtSchifffahrt/Abschaffung-der-Flugabgabe.pdf

12 Amongst other things, the stakeholders point out that wrong numbers were used and results have been wrongly interpreted.

A calculation of the impact of the revised Irish ATT (€ 3/€ 3) by IATA (2013) reports an annual increase in international and domestic passenger volumes of the abolishment of the ATT of 0.9 percent and 8.2 percent respectively, generating an additional GDP contribution of € 94 million and over 1,000 jobs.

3.5 Conclusions

The connectivity aviation helps to deliver is essential for countries to compete successfully in today's globalized economy. However, in many countries in Latin America and the Caribbean, the aviation tax regime limits the extent to which the full economic potential of connectivity can be exploited. The case studies provide examples of how aviation taxes can result in foregone economic growth opportunities and negatively affect consumer welfare. In the next chapter, an analysis of the average tax burden in Latin America and the Caribbean will be provided, as a starting point for our further analysis.

4 Taxes and charges in Latin America and the Caribbean

A wide variety of ticket taxes and charges are levied on air passengers in Latin America and the Caribbean. In some countries, passengers are charged for the use of airport facilities, services or security measures, while in other countries a departure tax or sales tax applies. Some of these taxes may be used to cover airport costs or for future airport development, whereas some charges are likely to be much higher than the actual costs of its stated purpose. As such, the distinction between a tax and a charge is rather hybrid. This chapter describes how taxes and charges are defined in this study, and an average tax and passenger-based charges burden is derived for each Latin American and Caribbean country.

In Latin America and the Caribbean, passengers are confronted with a wide variety of different taxes and charges. This analysis focuses on either passenger-based charges or air travel taxes. The latter includes all taxes passengers ought to pay over the base fare, such as airport tax, tourism tax, transportation tax, VAT or sales tax. There is a large grey area in defining which of these are taxes, and which are justifiable charges in terms of cost recovery. Charges are levied on facilities used by passengers, such as Passenger Service Charge (PSC) and security fees. In some countries, these charges are very high relative to the facility or service they are charged for, which indicates that part of the charge may actually be a tax.

Given the fact that there is not always a clear distinction between taxes and passenger-based charges, we have included both in the analysis. A distinction is made between taxes and charges in order to derive an 'average tax burden' as well as an 'average tax and charges burden' for each country. The 'average tax and charges burden' is defined as the sum of additional taxes and charges levied on a per passenger basis, either by the airport or the government. The 'average tax burden' focuses on actual taxes only.

All taxes and charges are obtained from IATA's *Ticket Tax Box Service* (TTBS). This data contains the majority of taxes and charges at the airport level. As a general rule, the classification of a tax or a charge depends on three high level criteria, which are:

1. The description and stated purpose of the tax or charge;
2. The government agency the tax or charge was ultimately remitted to;
3. The length of time the tax or charge has been in existence relative to its stated purpose.

4.1.1 Calculation of the average tax (and charges) burden per country

Using IATA's TTBS, we calculate an average tax (and charges) burden per country for the year 2014, the baseline year for our analysis. Separate tax and charges burdens are derived for domestic and international passengers, as the taxes and charges tend to be significantly higher for international passengers. If the amount of the tax or charge changes throughout the year, we calculate an average amount based on the number of effective days. In order to provide comparable

results, all charges are converted to US dollars if they are listed in another currency. We use average exchange rates for 2014, as provided by www.oanda.com (see Appendix A).

All taxes and charges are provided at the airport level. A weighted average level of taxes and charges is calculated at the country level. The airport's taxes and charges are weighted according to their share in domestic and international traffic.

As an example, Table 4.1 shows all taxes and charges levied by the two major airports in Ecuador, together comprising of 98 percent of international traffic and 73 percent of domestic traffic. The average international airport tax is calculated by: $\frac{52.27*54\%+25.75*44\%}{98\%} = \$40.40$. The weighted average of the other taxes and charges are calculated similarly.

Table 4.1 A weighted average tax at country level has been derived based on the passenger share of each airport (Ecuador used as an example)

	Share of intl. passengers	Share of domestic passengers	Airport Auxiliary Facilities Tax	Airport Tax (Intl.)	Airport Tax (Dom.)	Airport Tax II (Intl.)	Govt. Transportation Tax (Dom.)	Govt. Transportation Tax (Intl.)	Security fee (Dom.)	Security fee (Intl.)	Tourism fee
Domestic (D) / International (I)	I	I	I	I	D	I	D	I	D	I	I
Charge (C)/ Tax (T)			C	C	C	T	T	T	C	C	T
Quito (UIO)	54%	42%	$5	$52.27	$14.44	$40.80	12%	12%	$3	$3	$5
Guayaquil (GYE)	44%	31%	$5	$25.75	$5.15	$28.27	12%	12%	$1.53	$5.65	$5
Weighted average taxes and charges	98%	73%	**$5.00**	**$40.40**	**$10.48**	**$35.19**	**12%**	**12%**	**$2.37**	**$4.19**	**$5.00**

Source: IATA TTBS, elaboration SEO

The next step is to add up all the charges and taxes at the country level. We distinguish between fixed fees and taxes charged as a share of the ticket price[13]. There is a large dispersion in the level of taxes and charges per country, and there is also a large difference between the distribution of these costs between taxes and charges. For example, Brazil only has a fixed embarkation charge and no additional taxes. It is possible that these charges are higher than the actual cost level per passenger and therefore a part of this charge could be considered as a tax. On the contrary, in Uruguay only taxes are levied, in the form of a 'departure tax' of $ 41 and a 7.5 percent 'ticket sales tax'.

In order to derive an average taxes and charges burden for each country, the taxes levied as a percentage of the ticket price need to be translated into a fixed amount. For this purpose, we derived an average airfare for each country.[14] The level of the airfare differs between countries for various reasons. If a country has a relatively large number of long-haul flights compared to other

13 A list of all taxes and charges per country is given in Appendix B.

14 These airfares are derived from the SEO NetCost price model, which estimates airfares as a function of the trip distance, competition level and other route characteristics. The fares denote the costs of a one-way trip, including all taxes and charges.

countries in Latin-America, the average fare will be higher. This is the main reason for the higher average fares for Brazil and Argentina. Besides a shorter average stage length, other reasons for lower fares are more competition and a relatively high share of low cost carrier traffic.[15]

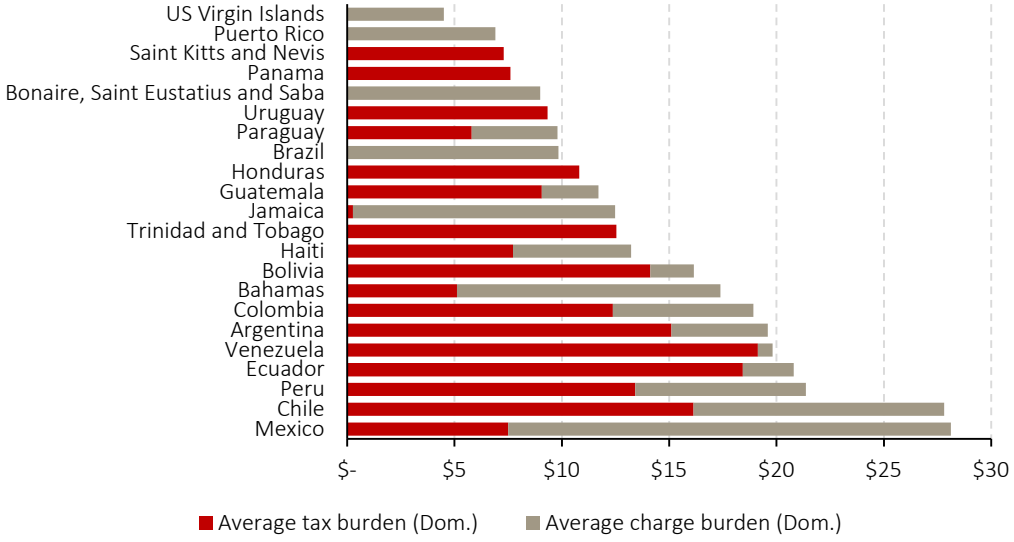
We derived an 'average tax burden' and an 'average tax and charges burden' for each country, based on the estimated average airfares and the listed taxes and charges. The taxes charged as a share of the ticket price are mostly calculated over the base fares, excluding other charges. However, the fares resulting from the NetCost model are airfares including all taxes and fees. Therefore, the other taxes and charges need to be subtracted from the average airfare. Using domestic travel in Ecuador as an example, the average costs of the 12 percent transportation tax is given by:

$$Transp.tax_{ecuador} = \frac{87 - 10.48 - 2.37}{1.12} * 0.12 = \$7.94$$

As a result, the total taxes and charges burden for domestic travel in Ecuador is given by $\$12.86 + \$7.94 = \$20.80$. The same calculation method has been applied to all other countries.[16]

Figure 4.1 shows the results of the overall taxes and charges burden for domestic travel. Figure 4.2. shows the 'average tax and charges burden' for international travel.

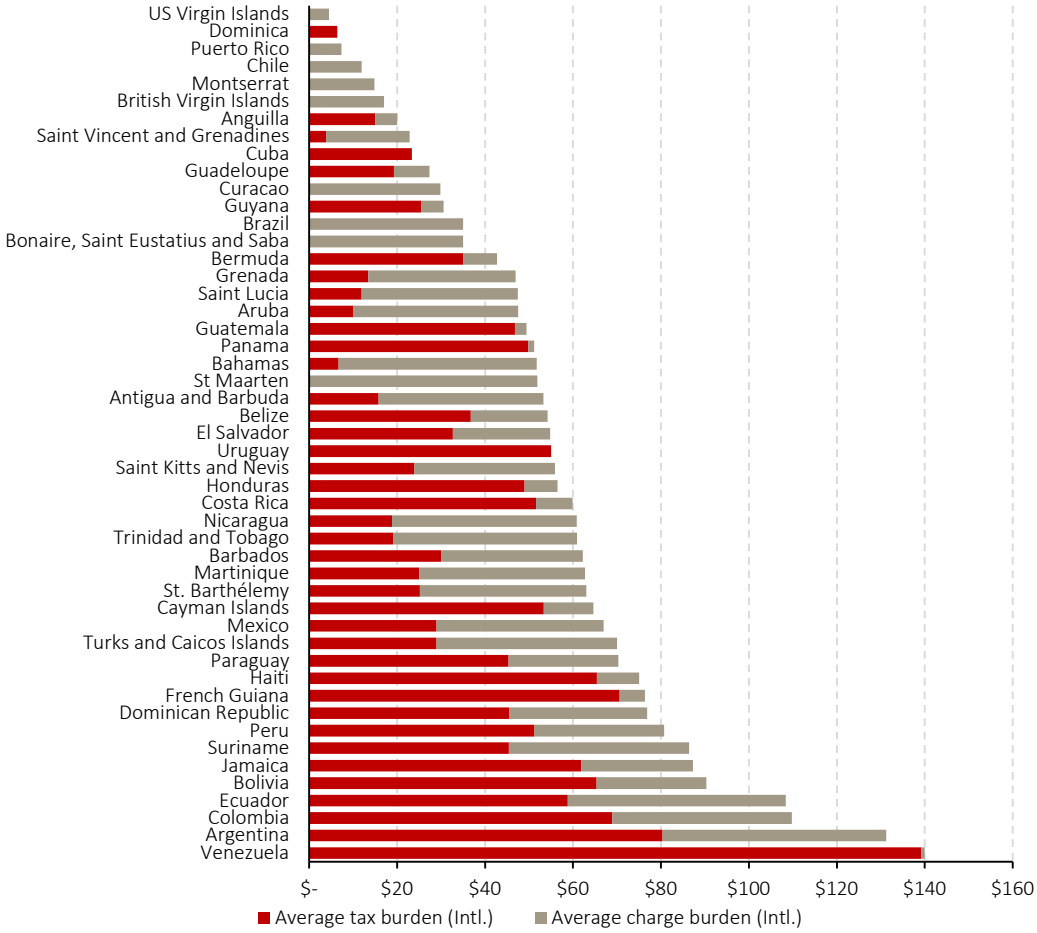
Figure 4.1 Domestic taxes and charges are relatively high in Mexico and Chile



Source: IATA TTBS, SEO analysis
Note: Countries not listed in the figures have no charges for domestic flights

15 Another factor that might drive up airfares is a relatively high share of business traffic.
16 Note that due to data limitations, the calculation does not account for VAT/sales tax on taxable ticket taxes or charges for the purpose of this analysis.

Figure 4.2 Venezuela has the highest average tax level for international flights



Source: IATA TTBS, SEO Analysis

5 Scope and scenario definition

Removal of aviation taxes and reduction of charges will lead to an increase in air passengers, and as a result stimulate connectivity by air. In addition, tax removal and charges reduction will enable stronger growth of air connectivity in future years and more passengers will benefit from lower air fares. In this chapter, we define two scenarios which have been used to estimate the economic benefits of reducing aviation taxes and passenger-based charges in Latin America.

In this chapter we set out the geographical scope and time dimension of this study. In addition, we discuss the two scenarios for which the consumer benefits and macro-economic impacts in Latin America and the Caribbean have been estimated. The final part of the chapter presents the air passengers and movement forecasts in the two different scenarios.

5.1 Scope

5.1.1 Geographical scope

The economic benefits of reducing aviation taxes have been estimated for Latin America and the Caribbean. Results are reported at the country level – with some of the Caribbean countries grouped together – as well as for three main sub-regions (see Figure 5.1):

- Central America and Mexico
- Caribbean
- South America

For the Caribbean, we have aggregated results from 29 countries and territories into 9 regions, because the Caribbean region consists of a large number of very small markets. Appendix C provides a full list of countries, Caribbean country groups and sub-regions as used throughout this study.

Figure 5.1 Results are reported for three different sub-regions

Source: SEO

5.1.2 Time dimension

The economic benefits of reducing air travel taxes have been estimated for three different time horizons:

1. **Immediate impacts:** Economic impacts in case of an immediate tax removal. They represent the impacts of a hypothetical tax removal in 2014, which is the base year of the analysis.
2. **Future impacts:** Economic impacts in case taxes are removed in one of the horizon years 2020, 2025 and 2035.
3. **Cumulative impacts:** Cumulative economic impacts of the removal of taxes now up to 2035. They represent a gradual decrease of taxes from the actual tax level in 2014 to a removal of taxes in 2020.

At the end of this section, estimates are provided for the immediate impact of tax removal on passenger numbers and aircraft movements. In addition, forecasts until 2035 are provided for the baseline and the two scenarios.

5.2 Scenario definition

This study investigates the potential economic benefits of removing aviation taxes and reducing passenger-based charges for the Latin American and Caribbean economies. Results are presented for two different scenarios: one in which all taxes are removed to zero and the other where -in addition- passenger based charges are reduced.

We define the following scenarios:

1. **'Tax Removal' scenario:** all aviation taxes are reduced to zero.
2. **'Tax Removal and Charges Reduction' scenario:** all aviation taxes are reduced to zero. In addition, all passenger based charges are reduced to the level of the 25th percentile in the sub-region.

Impacts for each scenario will be in comparison to a 'Baseline' scenario, in which taxes and charges remain at current levels.

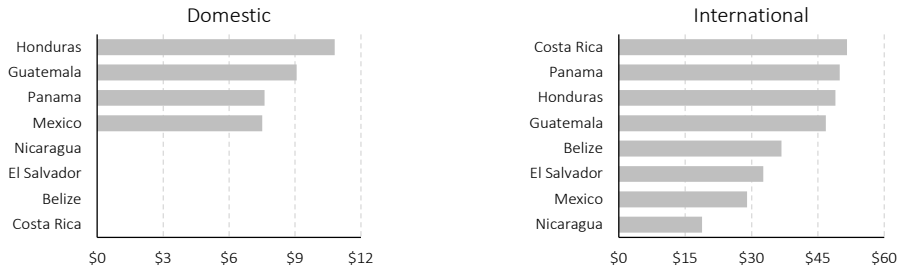
The first scenario measures the economic benefits of abolishing aviation taxes in Latin America. The distinction between a tax and a charge is a grey area, as discussed in chapter 4. The second scenario captures the impact of a reduction of these hybrid charges. This is modelled as a reduction to the 25th percentile rather than a full removal of these charges. As a part of these charges are legitimate in terms of cost recovery, a full removal of all charges is not realistic.

In the following subsections, we show the implications of these scenarios for the level of taxes and charges in each country.

5.2.1 'Tax Removal' scenario

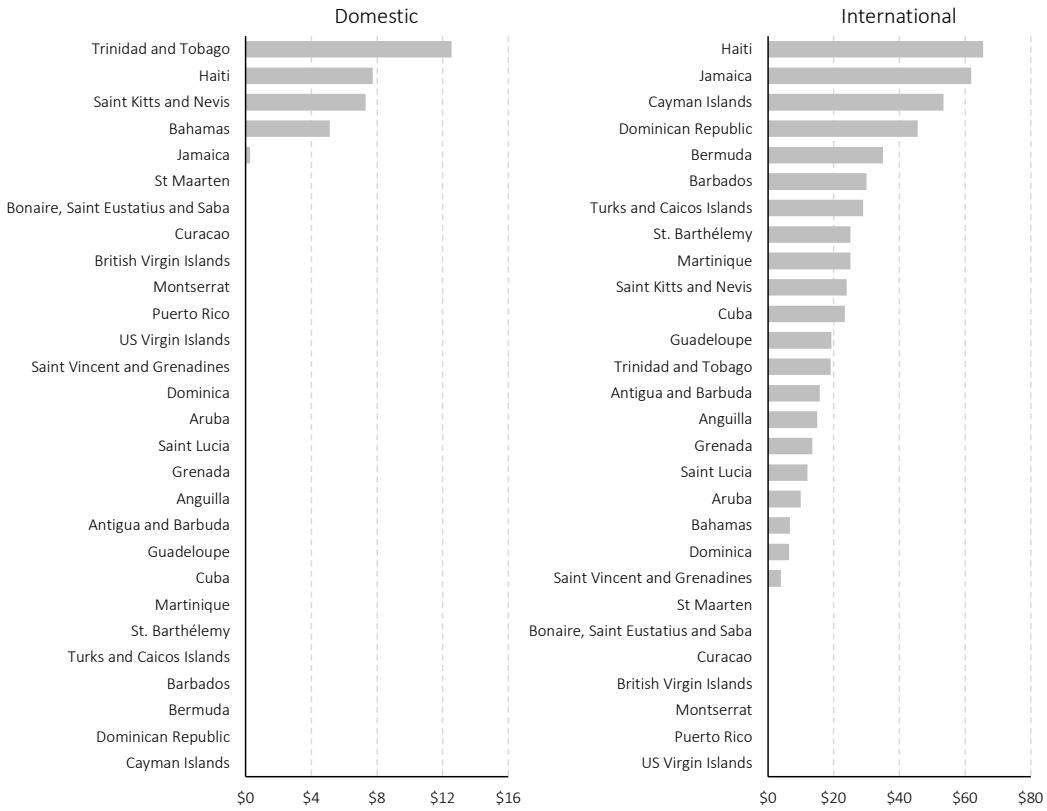
In the 'Tax Removal' scenario, all taxes are abolished. For some countries, this does not lead to any changes as there are no effective taxes. In South America, Brazil only levies an embarkation charge, but no taxes. In Chile, no taxes are levied on international passengers (see Figure 5.4). In the Caribbean region there are ample countries without taxes on international travel (see Figure 5.3).

Figure 5.2 In Central America and Mexico domestic taxes are highest in Honduras and international taxes are highest in Costa Rica



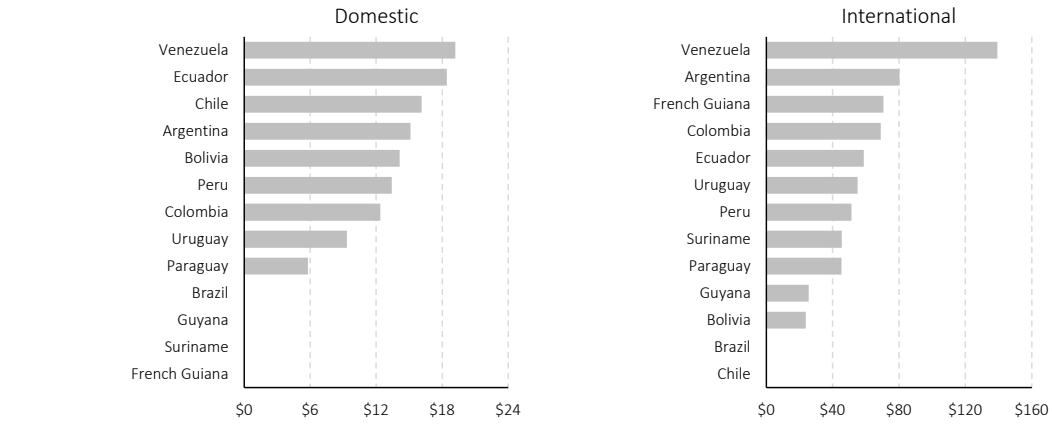
Source: IATA TTBS, elaboration SEO

Figure 5.3 In the Caribbean international taxes are highest in Haiti and Jamaica



Source: IATA TTBS, elaboration SEO

Figure 5.4 In South America both domestic and international taxes are highest in Venezuela



Source: IATA TTBS, elaboration SEO

5.2.2 'Tax Removal and Charges Reduction' scenario

In addition to taxes, charges are often higher than the costs of its stated purpose. As such, part of these charges may in fact be a tax. In the 'Tax Removal and Charges Reduction' scenario, all of

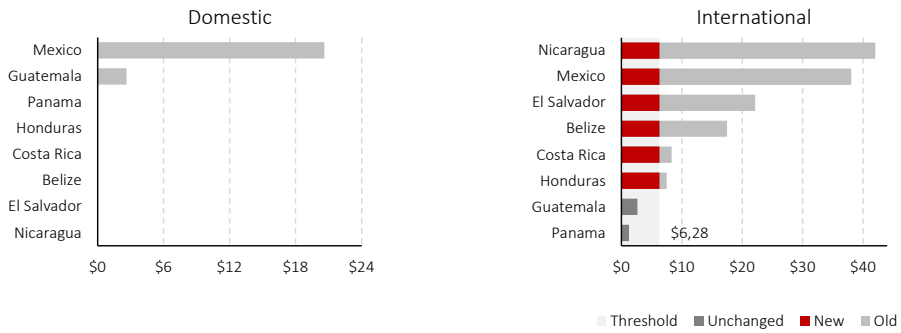
these passenger-based charges are reduced to the level of the lowest 25th percentile of the sub-region.

The 'Tax Removal and Charges Reduction' scenario captures three different aspects. Firstly, we have been very conservative in defining levies as a tax: where there was any doubt, levies were coded as a charge. Secondly, some levies are hybrids of which a part goes into general government revenues. Even if the full charge goes into airport revenues, some airports might operate inefficiently leading to excessively high charges.

For domestic travel in Central America and the Caribbean, all charges are removed in this scenario, since there are numerous countries which have no charges for domestic traffic (see Figure 5.5 and Figure 5.6). For South America, the 25th percentile level yields a charge of $ 2.12 per flight, leading to a charges decrease between $ 9.55/82 percent (Chile) and $ 0.26/11 percent (Ecuador) (see Figure 5.7).

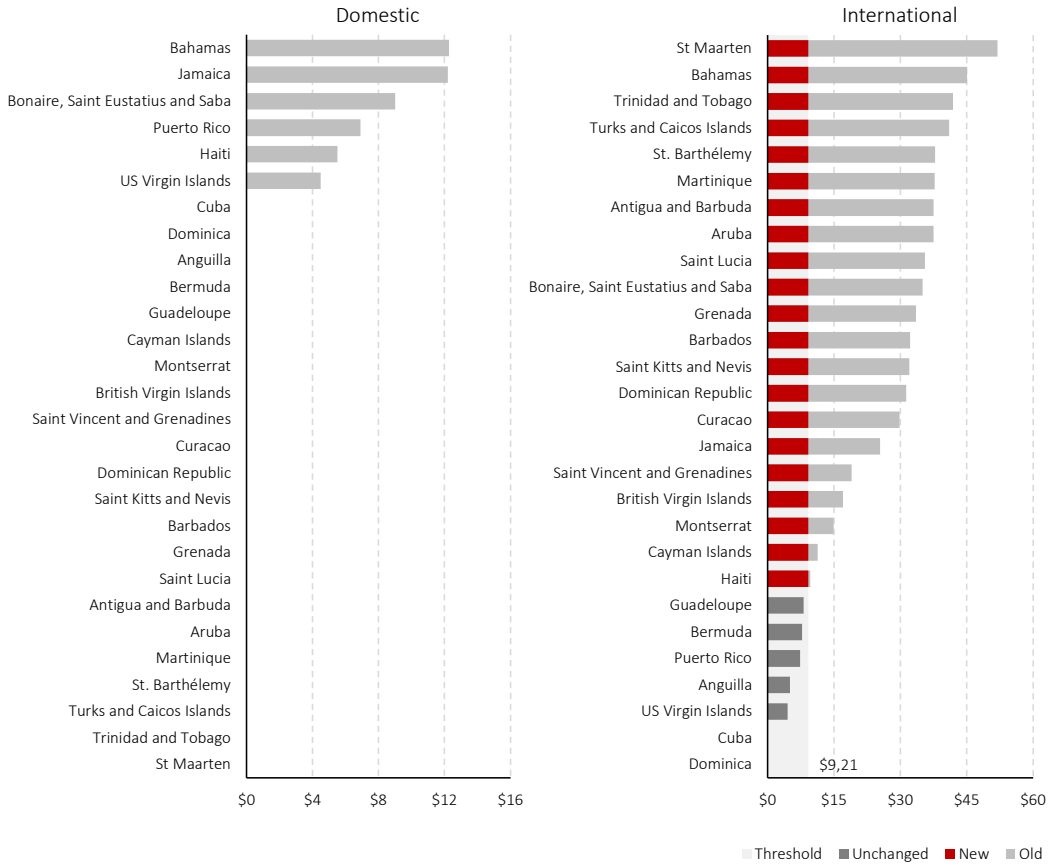
For international travel, charges for Central America, the Caribbean and South America are reduced to respectively $ 6.28, $ 9.21 and $ 5.78. This leads to a respective maximum charges decrease of $ 35.72/85 percent (Nicaragua), $ 42.70/84 percent (St Maarten) and $ 60.71/91 percent (Bolivia).

Figure 5.5 In the Central America and Mexico, domestic charges are set to $ 0 and international charges to $ 6.28 per departure



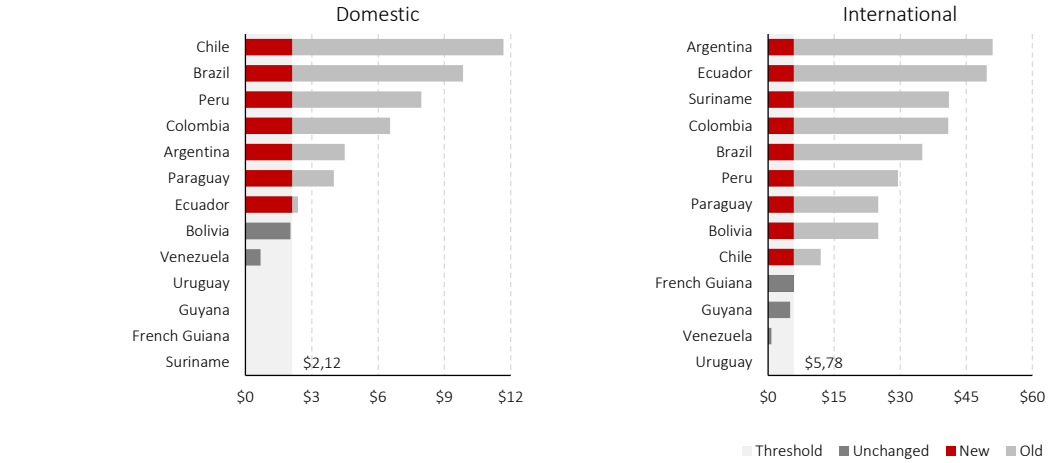
Source: IATA TTBS, elaboration SEO

Figure 5.6 In the Caribbean, domestic charges are set to $ 0 and international charges are reduced to $ 9.21 per departure



Source: IATA TTBS, elaboration SEO

Figure 5.7 In the South America, domestic charges are set to $ 2.12 and international charges to $ 5.78 per departure



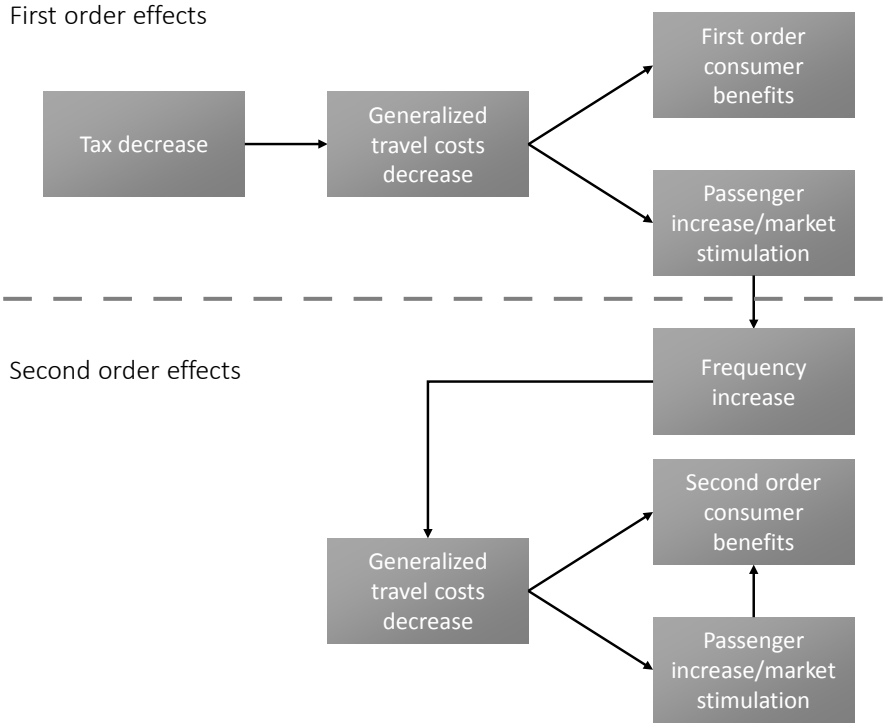
Source: IATA TTBS, elaboration SEO

5.3 Immediate impact on passengers and movements

The immediate impact analysis estimates the economic impact of an immediate removal of aviation taxes in Latin America. The analysis assumes that the reduction of taxes and charges in each of the two scenarios would have taken place in 2014 – which is the base year of our analysis – resulting in consumer benefits and macro-economic impacts in this year.

The consumer benefits (which will be discussed in detail in Chapter 6) for the base year have been calculated taking into account first and second order effects (see Figure 5.8). Existing passengers benefit directly from a decrease in travel costs following from the tax removal. Furthermore, due to lower travel costs more people are willing to travel, leading to additional demand or 'market stimulation'. In addition, second order effects occur. Airlines may offer more flights because of demand growth, resulting in consumer benefits for existing passengers as well as market stimulation.

Figure 5.8 Tax removal or charges reduction stimulates the market



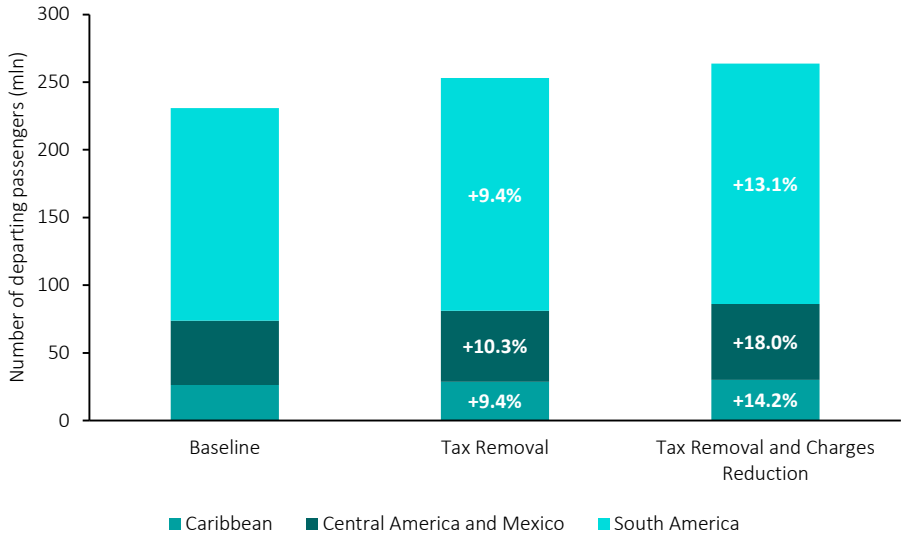
Source: SEO

5.3.1 Impact on passengers

Figure 5.9 shows that a tax or charges decrease may lead to substantial market stimulation. In the 'Tax Removal' scenario, the total number of passengers increases by 9.6 percent. The strongest relative increase is observed in Central America and Mexico, where the number of passengers increases by 10.3 percent. In South America and the Caribbean, the number of passengers increases by 9.4 percent in both sub-regions.

The level of market stimulation is substantially higher in the 'Tax Removal and Charges Reduction' scenario. The number of passengers increases by 14.2 percent to 264 million, compared to 231 million in the baseline.

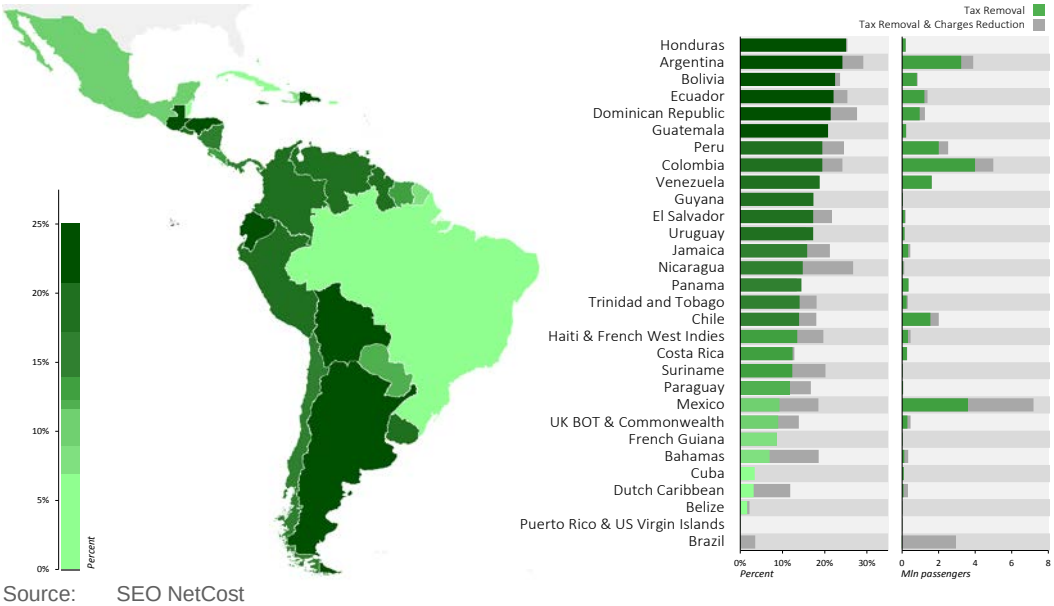
Figure 5.9 A decrease in taxes and charges may lead to a substantial passenger increase



Source: SEO NetCost

Figure 5.10 Passenger increases differ by country, mostly depending on the current tax regime and national aviation market sizes

Plotted in green is the relative and absolute effect of removing aviation taxes on passengers. The grey bars show the additional effects of also reducing aviation charges.

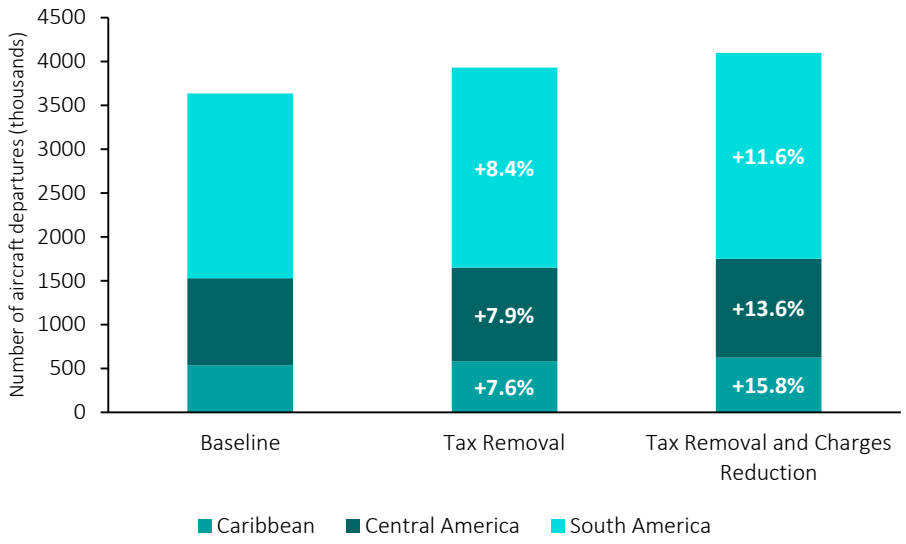


Source: SEO NetCost

5.3.2 Impact on aircraft movements

Airlines may react to a demand increase by offering more flights. As shown in Figure 5.11, the flight frequency increases from 3.6 million flights in the baseline to 3.9 million in the 'Tax Removal' scenario, and to 4.1 million in 'Tax Removal and Charges Reduction' scenario.

Figure 5.11 More flights will be operated due to higher demand following a decrease in the cost of air travel



Source: SEO NetCost

5.4 Future impact on passengers and movements

In addition to the analysis where taxes are removed at the present moment, we estimate the economic benefits if taxes or charges were reduced or abolished by 2020, 2025 or 2035. In order to estimate these welfare impacts, we extrapolate the aviation network of Latin American and Caribbean countries to the horizon years.

For the network extrapolation two sources were used. For the passenger growth forecast for Latin America and the Caribbean, we used country-level growth forecasts provided by IATA and Oxford Economics. For the extrapolation of the aviation networks outside Latin America and the Caribbean, we used regional forecasts from Boeing's Current Market Outlook (Boeing 2015). The latter network extrapolation is required because our model takes into account indirect connections, which includes flight legs that do not originate in Latin America.

The IATA/Oxford Economics forecast distinguishes between international and domestic routes. Because the growth forecasts tend to differ between these two types of traffic, we use different growth rates for domestic and international flights.

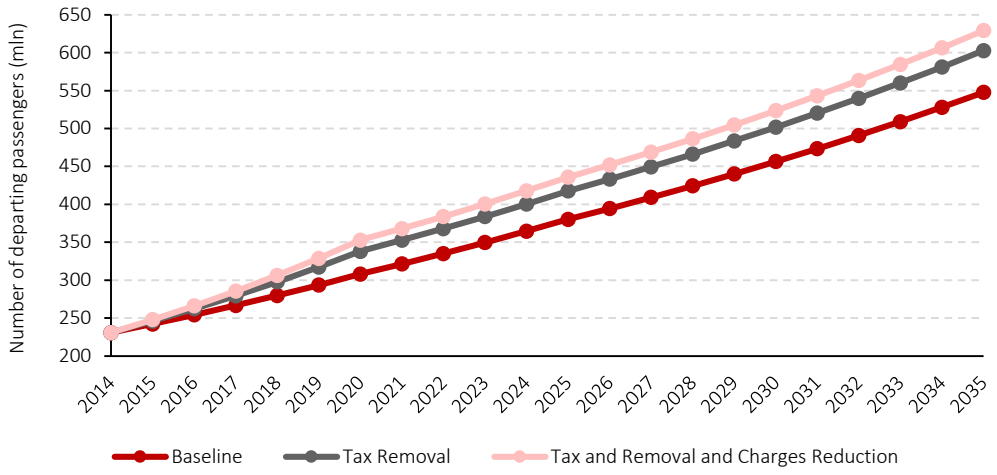
Both the IATA/Oxford Economics and Boeing forecasts are passenger forecasts. However, the growth rate of the number of flights will be smaller than the passenger growth rate because of the expected growth in average aircraft size. By means of a historical analysis of worldwide OAG data

since 1990, we have estimated the average aircraft size growth rate at 1.25 percent per year. We assume that the growth rate of the number of flights is 1.25 percent lower than the average passenger growth.

5.4.1 Passenger forecast

Figure 5.12 shows the passenger forecast for Latin America and the Caribbean in the 'Baseline' scenario as well as in the two scenarios. In 2035, 548 million passengers are expected to depart from the Latin American and Caribbean airports in the 'Tax Removal' scenario. In the 'Tax Removal and Charges Reduction' scenario, the total number of passengers is expected to increase by 15 percent to 629 million in 2035.

Figure 5.12 In 2035 over 80 million additional passengers will be served due to lower aviation taxes and charges



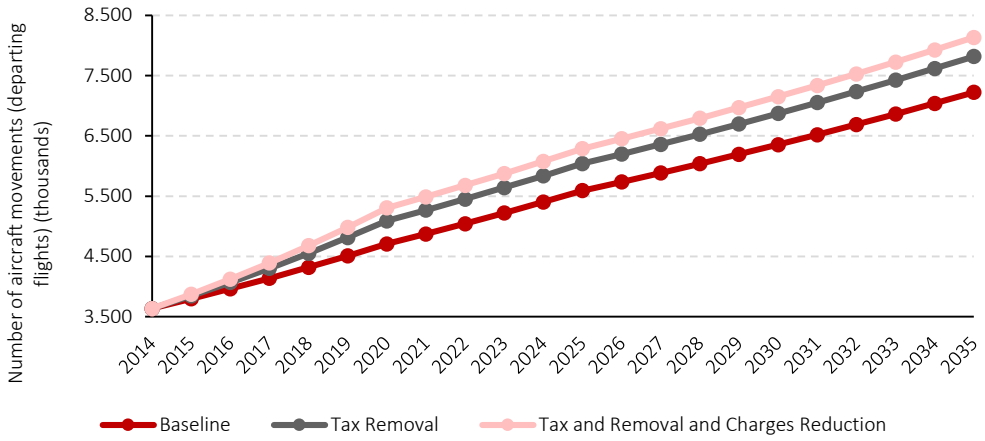
Source: IATA/Oxford Economics; Boeing (2015); SEO NetCost

5.4.2 Aircraft movements forecast

Figure 5.13 shows the projected increase in the number of flights departing from all Latin American and Caribbean airports in the two scenarios. In the 'Tax Removal and Charges Reduction' scenario in 2035, the total number of aircraft movements is expected to be 8.1 million, an increase of 13 percent compared to the baseline.

The increase in aircraft movements is smaller than the passenger increase, due to the fact that airlines can also serve more passengers through larger aircraft or higher load factors. In both scenarios the number of passengers per movement increases from 64 in 2014 to 77 in 2035.

Figure 5.13 In 2035 the number of aircraft movements will increase by almost 1 million if all taxes are abolished and charges were reduced



Source: IATA/Oxford Economics; Boeing (2015); SEO NetCost

6 Calculating the economic benefits of reducing aviation taxes: two approaches

To assess the economic benefits of removing aviation taxes in Latin America and the Caribbean, we use two different approaches. The first is the consumer benefit approach. The approach focuses primarily on consumer benefits as a result of travel cost savings, as well as the wider economic benefits associated with these savings. The second is the macro-economic approach. The approach calculates the macro-economic contribution of additional aviation activity in terms of GDP and employment growth.

6.1 Two approaches to assess the economic benefits of aviation tax reduction

We use two different approaches to assess the economic benefits of reducing aviation taxes up to 2035. The first is the consumer benefit approach. The approach takes into account the impacts of reducing aviation taxes that are valued by society. This includes the money and time saved by air travellers because of less money spent on air fares, but also because of more frequencies and direct flights. In addition, it includes the additional benefits to the wider economy.

The second is the macro-economic approach. The approach calculates the economic contribution of additional aviation activity in terms of GDP and employment growth. In this chapter, we explain both approaches and highlight the differences between the two.

Why do we use two approaches side by side? On the one hand, the consumer benefit approach is in line with the best-practice in the appraisal of infrastructure investments and policy measures in transport economics. Amongst other things, the consumer benefit approach quantifies a number of elements that are valued by society (such as the value of time savings for leisure travellers), which are not included in the macro-economic approach. Furthermore, the macro-economic approach measures the gross impacts, without adjusting for labour costs and capital costs, while the consumer benefit approach aims to measure the net welfare impacts. As a result, the macro-economic approach tends to result in much higher numbers than the consumer benefit approach. On the other hand, the macro-economic approach provides easy to understand estimates regarding the additional macro-economic output resulting from a growth in air transport, using well-known indicators such as GDP and number of jobs.

Although there is some overlap between both approaches (for example, cost savings for business travellers are reflected in GDP growth), they are different approaches, of which the results cannot be added up and must not be directly compared.

6.2 Consumer benefit approach

The consumer benefit approach takes the perspective of consumer welfare benefits of tax reduction. The economic welfare benefit is the total benefit to society from a certain policy

intervention or economic transaction. In our case, we calculate firstly the consumer welfare benefits as well as the wider economic benefits of reducing aviation taxes at the present moment, in comparison to a scenario in which those taxes would not be removed. Secondly, we estimate the consumer benefits and wider economic benefits of aviation tax reductions up to 2035, in comparison to a scenario in which those taxes would still be present.

We distinguish between different benefits:

- **Consumer benefits ('consumer surplus' for both business and leisure trips).** Reducing aviation taxes brings benefits to the passenger. These benefits include lower air fares (in case of full pass through) and benefits from better connectivity (more frequencies and more direct flight destinations). These lower 'generalized' travel costs translate into a direct consumer welfare benefit or consumer surplus. Consumer surplus is a widely accepted way of quantifying changes in welfare from policy interventions. It is the amount consumers are willing to pay for a good or service in excess of the actual price they pay for the good or service without these interventions.
- **Impact for suppliers of aviation services (producer surplus).** We assume that airlines will pass on any tax reductions to consumers in the long run, as they operate in a competitive market and profitability margins in the Latin American airline industry are low. Hence, airlines will benefit from additional passenger demand, which may generate a 'normal economic profit', but do not generate excess profits because of a reduction of aviation taxes. The same holds true for other stakeholders in the aviation value chain.
- **Wider economic benefits.** Important sources of additional wider economic benefits are agglomeration effects. Connectivity growth in an airport region may lead to higher density of activities in that region. Concentration of economic activity in itself can reduce (spatial) market imperfections and result in higher productivity measured in GDP/capita, for example because of knowledge spill overs, a pooled labour market and consumption variety. In the case of Latin America, aviation growth also results in job creation, reducing the high unemployment levels. Also the additional job creation constitutes a welfare gain.

Scope of the consumer benefit approach

We note that this study quantifies the consumer and wider economic benefits of tax removal and charges reduction. The estimation of environmental externalities and the opportunity costs of a tax/charges reduction (i.e. the impacts of aviation tax revenue spending changes on the wider economy) is outside the scope of this study.

6.3 Macro-economic approach

In the macro-economic approach we estimate the impacts of an increase in air travel on total GDP and employment. For this purpose, we have carried out a panel data analysis with time-lag variables. Using the elasticities from this analysis, we estimate the macro-economic impact of growth in air passengers and connectivity.

Within the macro-economic approach, we also consider the catalytic impacts of air transport growth. Catalytic impacts capture the extent to which the growth in air transport boosts performance in other industries. For example, air transport growth may impact tourism, investment and innovation. These effects are the direct result from people and companies using air transport

for private or business purposes. These effects all contribute to the total GDP impact of air travel. As such, the catalytic impacts are a specification of the total GDP impact and not additional impacts.

6.4 Differences between the two approaches

The welfare benefits as addressed in section 6.2 are only partly captured in macro-economic output measures such as GDP. For instance, the fact that airfares for leisure passengers are reduced because of lower aviation taxes will not result in higher GDP. However, lower ticket prices for business passengers may result in lower cost levels for companies and therefore in a higher GDP.

Another difference between the consumer benefit and economic contribution approach is the fact that the welfare approach estimates the impacts for residents and companies in Latin America and the Caribbean. The macro-economic approach also takes into account the impact of non-Latin American companies located in the region.

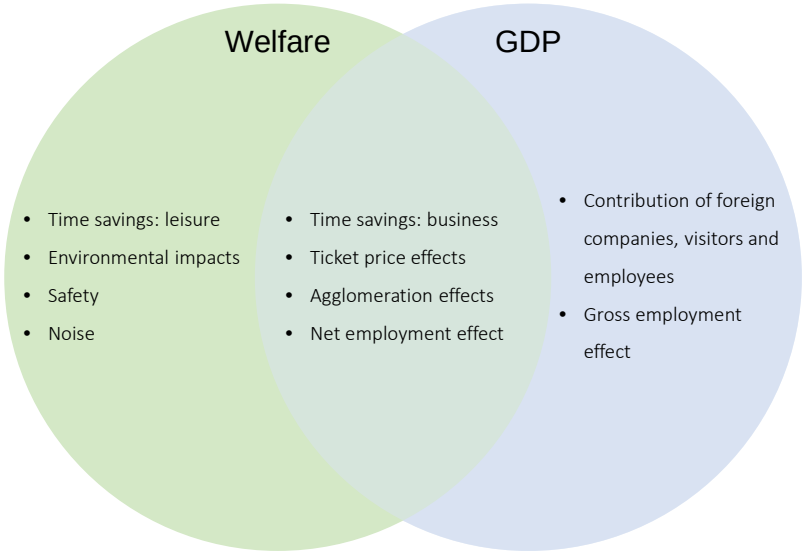
Finally, the macro-economic approach tends to measure the gross impacts, without adjusting for labour costs and capital costs. Aviation growth due to reduced aviation taxes may lead to more jobs in a certain region. Generally, employing people entails costs, not only to their employers but also to society. The size of these costs depends on the type of jobs and on the labour market situation. If unemployed people fill the jobs, the labour costs are partly compensated by reduced unemployment benefits. If the jobs will be filled in by employees coming from other industries or from outside their own region, the costs consist of production lost in these other industries or regions. In this case, employment impacts are distributional effects rather than a net job growth effect. However, employees may be more productive in their new job, creating net welfare benefits.

Differences between the two approaches

As mentioned above, the two approaches are different. Therefore, the resulting figures cannot be combined nor added up. Below we summarize the three main differences:

- Benefits for leisure travellers are not included in the GDP approach;
- Different geographical coverage: the welfare approach estimates the impacts of Latin American and Caribbean residents and companies, whereas the economic contribution approach also takes into account the impact of non-Latin American/Caribbean companies located in Latin America/ Caribbean;
- Net versus gross impacts: the welfare approach estimates the net impacts on welfare, taking into account not only the benefits but also the costs of capital and cost of employing labour.

Figure 6.1 Differences and overlap between the consumer benefit (welfare) and macro-economic approach (GDP)



Source: SEO

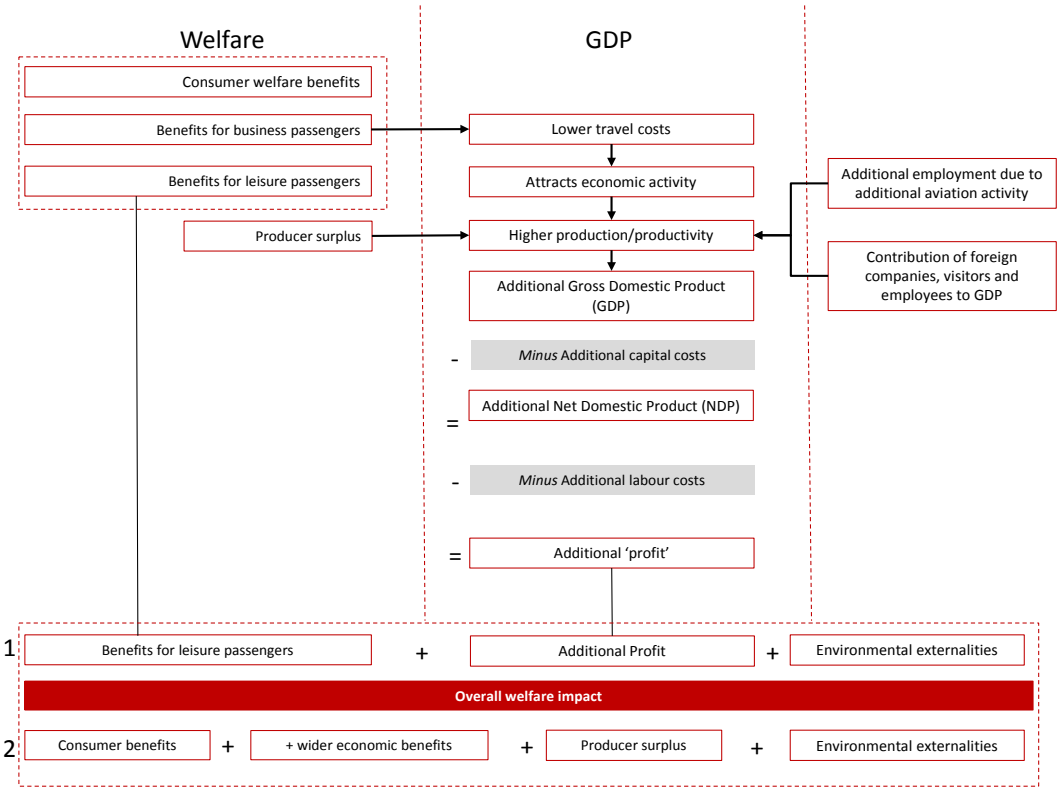
In a typical analysis to estimate the welfare benefits of a certain policy intervention (for example, a reduction of aviation taxes), one adds up the consumer welfare benefits for both business and leisure passengers, any producer surplus, as well as monetized environmental impacts. In addition, there may be additional, wider economic benefits associated with aviation growth. Estimates in the literature vary, but 0-30 percent additional wider economic impacts may be added to total welfare impacts based on existing studies.[17] [18] This approach has been followed in chapter 7 and is also visible in Figure 6.2 (item 2).[19]

[17] The 0-30% is based on a number of studies on the additional wider economic benefits: Mott MacDonald (2006) 17 percent; MVA (2006) 30-50 percent; Elhorst & Oosterhaven (2008) -1 to +38 percent; SACTRA (1999) 6 percent; Venables & Gasiorek (1999) 30-50 percent.

[18] Computable General Equilibrium (CGE) analysis is another way of estimating the wider economic benefits. CGE models represent the whole economy, including feedback loops within the economy (Dwyer et al. 2004). It can be used to estimate long-term, net impacts on output indicators such as GDP and jobs, but also on welfare. CGE models include factor (capital, labour) and commodity markets and model the behaviour of production sectors, households and governments. CGE models are often based on (aggregated) Input-Output tables. They estimate the same direct effects of policy measures as IO Analysis does. As opposed to IO analysis, CGE analysis also adjusts prices and wages. Prices and wages are adjusted until production and employment in the entire economy are in an equilibrium state. CGE analysis therefore is an economy wide impact analysis. One of the main drawbacks is its level of aggregation, which makes the application challenging for aviation-specific interventions. In addition, the evidence base required to provide the front-end of the CGE model (e.g. changes in accessibility as a result of aviation tax reductions) is particularly challenging (see e.g. Mackie & Pearce 2015) and outside the scope of this study.

[19] Any environmental externalities have not been quantified in this study.

Figure 6.2 Relationship between GDP and welfare measurement units



Source: SEO

In chapter 8, we estimate the impacts on GDP and employment using the macro-economic approach. As Figure 6.2 points out, estimating the impact on an output measure such as GDP is essentially a different thing. Part of the welfare benefits (producer surplus and benefits for business passengers) go into the GDP equation, but not the benefits for leisure passengers. GDP impacts are also affected by the contribution of foreign companies and visitors to Latin American and Caribbean GDP as a result of better connectivity.

Figure 6.2 shows that the GDP impact cannot be simply added to estimated welfare impacts. This would result in double counting and would neglect the fact that additional GDP is associated with additional labour costs and capital costs.[20] Calculated GDP impacts therefore tend to be much larger than welfare impacts. If we would like to bring GDP impacts in line with welfare impacts, GDP impacts needs to be reduced to the real 'additional GDP profit', after correcting for capital and labour costs (approach 1 in Figure 6.2). The additional profit can be added to the benefits for leisure passengers and any monetized environmental impacts, which together constitute the total welfare impact.

From the discussion follows first of all that approach (1) in Figure 6.2 is generally very cumbersome. Hence, it is easier to measure welfare impacts following approach (2). Secondly, unadjusted GDP and welfare impacts are related but measure different things.

[20] See also Forsyth (2013), p.24-25; Forsyth (2014)

In chapter 7, we discuss the estimation of consumer benefits/welfare impacts following the consumer approach. In chapter 8, we discuss the macro-economic impacts on GDP and employment following the macro-economic approach. The GDP effects calculated are the unadjusted GDP impacts, not corrected for labour and capital costs.

7 Consumer benefits of reducing aviation taxes

Removal of aviation taxes brings substantial consumer benefits to residents of Latin America and the Caribbean. In 2035, consumer benefits add up to $ 13 billion. If also passenger based charges are reduced, these benefits will increase to $ 19 billion. Additional to these direct benefits, wider economic welfare benefits arise through agglomeration effects and additional employment. Total consumer and wider economic benefits add up to $ 15-$ 21 billion in 2035, depending on the scenario. Total present value over the period 2014-2035 cumulates to $ 122 to $ 170 billion, depending on the scenario.

7.1 Methodology

7.1.1 Consumer benefits

Consumer surplus is a widely accepted way of quantifying changes in welfare from policy interventions. In short, consumer surplus is a concept of monetized welfare. It is the amount consumers are willing to pay for these policy interventions in excess of the actual price they pay for the service without these interventions. In the context of connectivity and air travel, consumer surplus relates to the change in welfare as a result of a change in the generalized travel costs. The generalized travel costs include direct costs (such as ticket prices) and a valuation of travel time. To estimate the economic benefits of a removal of aviation taxes, the change in consumer surplus/ consumer benefits can be calculated as a result of a change in generalized travel costs.

With SEO's NetCost generalized travel cost model, we calculate the consumer surplus in the different scenarios and future years. We call these gains 'consumer benefits'.

The NetCost generalized travel cost model

The NetCost model measures the quality of airline networks, looking at both direct and indirect (transfer) connections. The model translates airline network data (origin, destination, frequency and travel time) into indicators expressing the attractiveness of specific connections (and airlines) for the user. For each relevant connection, direct as well as indirect, the model determines the generalized travel costs, being a representation of all inconveniences the traveller is confronted with for that specific connection. Generalized travel costs include not only airfares, but also the perceived costs of travel time and waiting time for the next flight ('schedule delay'). These costs are translated into an indicator, expressing the perceived value for the consumer (passenger). Using these generalized travel costs, NetCost is able to estimate market shares of routes, airlines and airports in each individual OD market.

The model is a useful tool in forecasting, particularly if network scenarios need to be considered. Generalized travel costs, passenger numbers and any market (de)generation can be translated into consumer welfare estimates (consumer surplus) of a network scenario compared to a reference situation. We refer to Appendix D for a description of the NetCost model.

Origin of passengers

We estimate the consumer benefits of a decrease in aviation taxes and charges in Latin America and the Caribbean for residents of each country separately. There are two channels through which these benefits accrue. In the first place, all originating, resident passengers benefit from a tax

decrease in their respective countries. In addition, passengers travelling to other Latin American countries benefit from tax decreases in the destination country.

In order to estimate consumer benefits for residents of each Latin American and Caribbean country or sub-region separately, we require information on the share of resident (and non-resident) origin-destination passengers for each route. As these data are not available, we use UNWTO (United Nations World Tourism Organization) tourism data as a proxy to estimate the share of local residents in total international traffic.

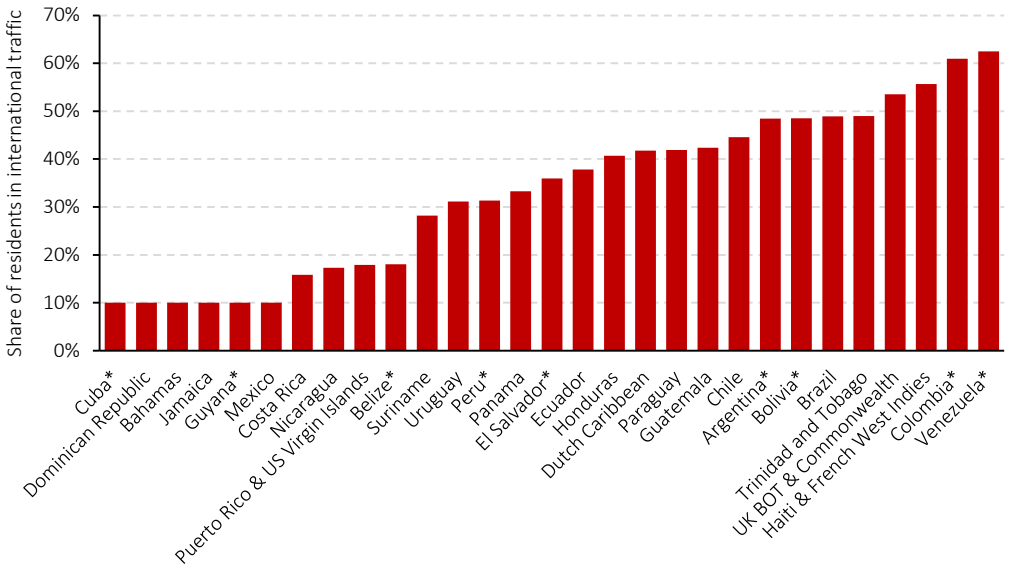
Estimating the share of resident air traffic

We compared the number of tourist arrivals by air according to UNWTO data with the total number of international passengers in 2014 from PaxIS. For some countries, the number of tourists is not available for 2014, therefore we compared 2013 tourism data with 2014 passenger data. Hence, the data is not perfectly comparable for all countries, but still is a valuable proxy for the share of inbound passengers.

We assume that the number of non-resident passengers does not exceed 90 percent of the international traffic. For countries for which the tourist share based on UNWTO data exceeds 90 percent, we assume that 90 percent of the international passengers are non-resident passengers. This is the case for Cuba and the Dominican Republic.

Figure 7.1 shows the share of local residents in the total international traffic for all Latin American countries and sub-regions. For important tourist destinations, the share of local residents in international traffic is limited. This is particularly true if these are low-income countries, where the local population may not be able to afford international air tickets.

Figure 7.1 For some countries only 10 percent of the international passengers are local residents



Note: * = UNWTO tourism data of 2013. UNWTO data for French Guiana unavailable
Source: UNWTO (2015); IATA PaxIS; elaboration SEO

The estimated share of resident traffic in Figure 7.1 is in line with expectations. Main tourist destinations such as the Dominican Republic, Bahamas and Jamaica have a high share of non-resident, inbound traffic. The same holds for Cuba, where the low income of residents limits the propensity to fly of the local population. For some Caribbean regions, such as the British Overseas

Territories, the French West Indies and the Dutch Caribbean one might expect a higher share of tourists/inbound traffic. The main cause of the low share in this analysis can be attributed to the definition of international passengers: traffic between different countries within the same sub-region is considered as international traffic. As a result, a large share of international passengers is travelling between various islands in the Caribbean region.

Travel motive

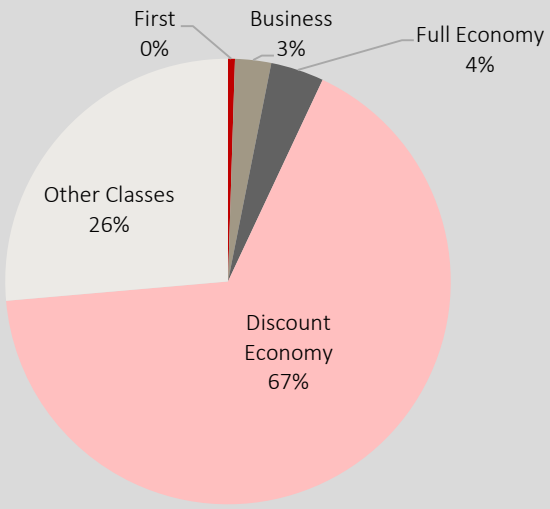
The welfare analysis distinguishes between passengers travelling for business and leisure purposes. Passengers travelling for business tend to be more time-sensitive than leisure passengers and are less price sensitive. Based on PaxIS booking data for different fare classes, we estimated the share of passengers travelling for business in the baseline scenario in 2014.

Booking class data and travel motive

IATA PaxIS booking class data distinguishes five different booking classes: First, Business, Full Economy, Discount Economy and other classes. The division of bookings over these classes in Latin America is shown in Figure 7.2. One can observe that 93 percent of bookings occurs in the two lowest fare classes.

Industry averages indicate that the share of passengers travelling for business is often over 20 percent, implying that a portion of these passengers travel in one of the lower two fare classes. Hence, we assume that 20 percent of the passengers in the lower fare classes travel for a business motive, and all passengers in the three most expensive fare classes are passengers travelling for business. As such, the number of premium passengers (First, Business or Full Economy class) is used to differentiate between the share of passengers travelling for business per country.

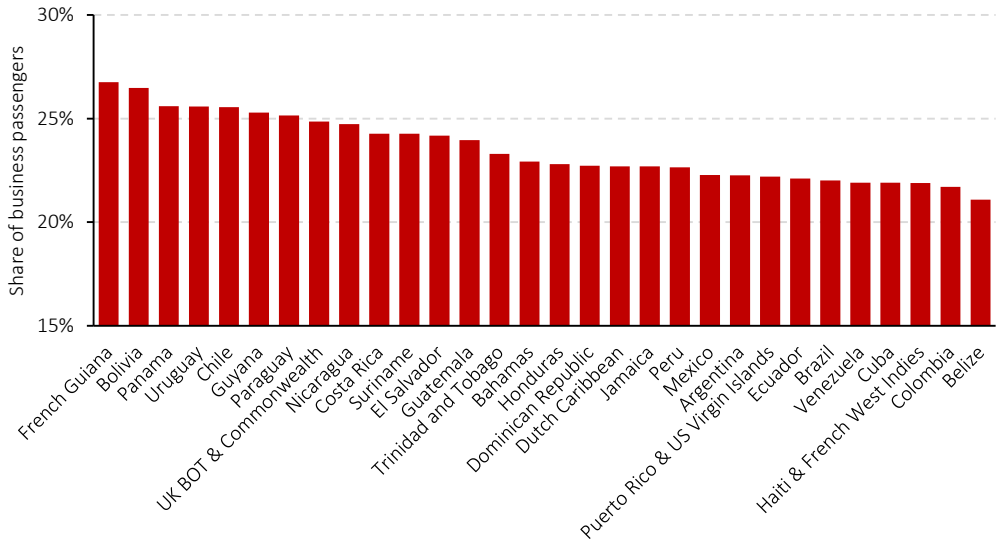
Figure 7.2 The largest share of bookings in Latin America is in the two lowest fare classes



Source: IATA PaxIS

Figure 7.3 shows that the share of passengers travelling for business does not show a very strong variation across the different countries or sub-regions. The highest share of passengers travelling for business reasons is found in French Guiana (27 percent), whereas Belize has the lowest share of passengers travelling for business reasons (21 percent).

Figure 7.3 The share of passengers travelling for business fluctuates between 21 and 27 percent



Source: IATA PaxIS; elaboration SEO

We assume the business/leisure share remains constant over time for the 'Baseline' scenario. Due to the higher price sensitivity of leisure passengers, the latter type of passengers increases relatively more. As a result, the share of leisure passengers increases due to the decrease in taxes or charges in the scenarios.

7.1.2 Wider economic benefits

Direct consumer benefits may generate wider benefits for the economy. The direct user benefits for air passengers caused by a decrease in aviation taxes will to a large extent be passed on to other sectors of the economy. As a result, businesses and households that do not use aviation may still benefit from an aviation tax decrease, for example because companies pass on lower transport costs to end users via lower prices. Companies may also benefit from higher profits and as a result, will invest more. Hence, direct user benefits may have wider economic (or indirect) impacts outside the aviation industry itself.

However, not all these wider benefits are additional benefits. When there are no market imperfections and no cross-border impacts, total welfare benefits will be equal to the direct benefits. In this case, there are no additional wider economic impacts.

Agglomeration effects

There may be additional wider economic benefits in case of market imperfections.[21] Important sources of additional wider economic effects are the agglomeration effects. Connectivity growth in an airport region may lead to a higher density of activities in that region. Concentration of economic activities in itself can reduce (spatial) market imperfections and result in higher productivity

[21] As Vickerman (2007) puts it, by the additional wider economic benefits "[..] we mean all economic benefits which are not captured in the direct user benefits of the type which are normally analysed in a well-constructed transport cost-benefit analysis after allowing for environmental and other directly imposed external costs".

measured in GDP/capita, for example because of knowledge spill-overs, a pooled labour market and consumption variety.

The empirical evidence on the *additional* wider economic benefits of aviation growth is scarce.[22,23] In this study, we rely on the guidelines by the CPB Netherlands Bureau for Economic Policy analysis that additional wider effects are between 0-30 percent of the impacts of aviation users (Elhorst et al. 2004)[24]. We use 15 percent of the users travelling on a business motive, as business travel and not leisure travel is likely to generate additional welfare impacts elsewhere in the economy.

Employment effects

In addition to these agglomeration effects, other wider economic benefits may arise due to an increase in employment. If an increase in connectivity leads to additional job creation, the welfare benefit of each job is equal to the average tax burden per job (difference between the employer's cost of labour and the employees net income). This follows from labour supply theory, in which (at the margin) unemployed people valuate their leisure time equal to the net wage level. When these people become employed, their productivity is (at least) equal to their wage costs. Hence, the consumer welfare benefits per job are approximately equal to their wage costs minus their net wage.

Another way job creation might occur is through a shift from informal employment to registered employment. In Latin America a significant share of the population is currently working in informal activities. As no tax is paid over informal labour, net and gross wages are equal. In case of a transition from informal to formal labour, productivity increases while the worker's net wage remains (approximately) equal. As such, the welfare gains again equal the difference between gross and net income.

The difference in gross and net wages is estimated by using the tax burden on income, profits and capital gains as a percentage of GDP. This data is obtained from two sources, being the Worldbank and CEPALSTAT, where we used the former data source if available and the latter otherwise.[25] Using this data, we estimate the welfare impact per additional job by:

$$\frac{GDP}{job} * \frac{tax}{GDP} = \frac{tax}{job}$$

22 As Forsyth (2013, p.15) puts it: "[..] there is an externality present. There is a problem of measuring how large this externality is". According to a review of studies on investments in transport infrastructure, Rouwendal (2012) concludes that there are indications that additional indirect effects can be substantial (positive but also negative) in case of imperfect competition but that "[..] the question about the importance of additional indirect effects is still open and it is therefore unclear what level of generality can be attached to them" (Rouwendal 2012, p.5)

23 Some researchers (Forsyth 2013) therefore argue that a combination of a welfare/CBA approach with Computable General Equilibrium modelling could be a way to overcome the lack of insight into the wider economic benefits of aviation connectivity growth. Yet, such exercises are cumbersome, data-demanding and generally outside the scope of project evaluations.

24 The 0-30 percent guideline is based on a number of studies on the additional wider economic benefits: Mott MacDonald (2006) 17 percent; MVA (2006) 30-50 percent; Elhorst & Oosterhaven (2008) -1 to +38 percent; SACTRA (1999) 6 perent; Venables & Gasiorek (1999) 30-50 percent.

25 For some countries no data on the average tax burden is available. For the Bahamas, Puerto Rico/US Virgin Islands and UK BOT a 0% tax burden is used due to low/zero income tax level. For Guyana we applied the average income tax burden for South America, and for Trinidad and Tobago the average income tax burden of the Caribbean.

Increases in the number of jobs in each scenario are derived from our employment estimations in Chapter 8. As Latin American countries are generally far from full employment, it is reasonable to assume that estimated job gains are real additional jobs and not redistributions within the economy.

Tourism revenues
A decrease of aviation taxes leads to an increase in incoming tourists. This leads to a significant economic contribution, particularly in economies with a strong focus on tourism. However, we should prevent double counting with employment impacts. Increased tourism revenues lead to additional job creation, for which the welfare impacts are calculated using the methodology described above. Welfare impacts additional to these employment impacts could arise if excess profits are made in the tourism industry, which are higher than in other sectors. We are not able to check whether these excess profits exist in the tourism sector. In the event that these profits exist, it is unknown whether these lead to welfare impacts in the respective country, as they might "leak away" to other countries (e.g. via large international hotel chains). To be on the conservative side, we assume that there are no additional welfare impacts through an increase in tourism expenditure over and above the agglomeration benefits and employment benefits described above.

7.1.3 Scope

We note that this study quantifies the consumer and wider economic benefits of tax removal and charges reduction. The estimation of environmental externalities and the opportunity costs of a tax/charges reduction (i.e. the impacts of tax revenue spending in the wider economy) is outside the scope of this study.

7.2 Overall benefits in Latin America and the Caribbean

7.2.1 Immediate tax removal and charges reduction

This section presents the estimated consumer welfare impacts in the event that taxes and charges are decreased immediately.[26] In Chapter 5, we have shown that a removal of taxes or reduction of charges results in a significant increase in passengers in Latin America. Both existing passengers and new passengers benefit from a cost reduction and frequency increase.

'Tax Removal' scenario
The immediate aggregate consumer benefits for Latin America and the Caribbean add up to $ 5.8 billion if all taxes were abolished immediately (see Table 7.1). The largest share of total consumer benefits (73 percent) is generated by leisure passengers. However, per passenger benefits are higher for passengers travelling for business than for leisure passengers ($ 65 for business versus $ 46 for leisure). Because air fares for business passengers are generally higher, higher price reductions follow from the removal of taxes in case these taxes are a percentage of the ticket price. In addition,

[26] Modelled as a tax removal and charges decrease in the base year 2014

business passengers are more time sensitive. Therefore, these passengers benefit relatively more from travel time decreases resulting from increased flight frequencies.

Table 7.1 In the 'Tax Removal' scenario total consumer benefits add up to $ 5.7 billion

		Business	Leisure	Total
'Tax Removal' scenario	Number of passengers residing in Latin America (thousands)	24,281	90,554	**114,835**
	Total consumer benefits (mln USD)	1,578	4,175	**5,752**
	Benefits per passenger (USD)	$65	$46	**$50**

Source: SEO NetCost

'Tax Removal and Charges Reduction' scenario

If, in addition, the passenger based charges were reduced, total consumer benefits accrue to $ 7.9 billion (see Table 7.2). Again, the largest share of welfare benefits are generated by leisure passengers, consisting of 74 percent of the total consumer welfare benefits. Per passenger benefits are $ 84 for business passengers and $ 61 for leisure passengers.

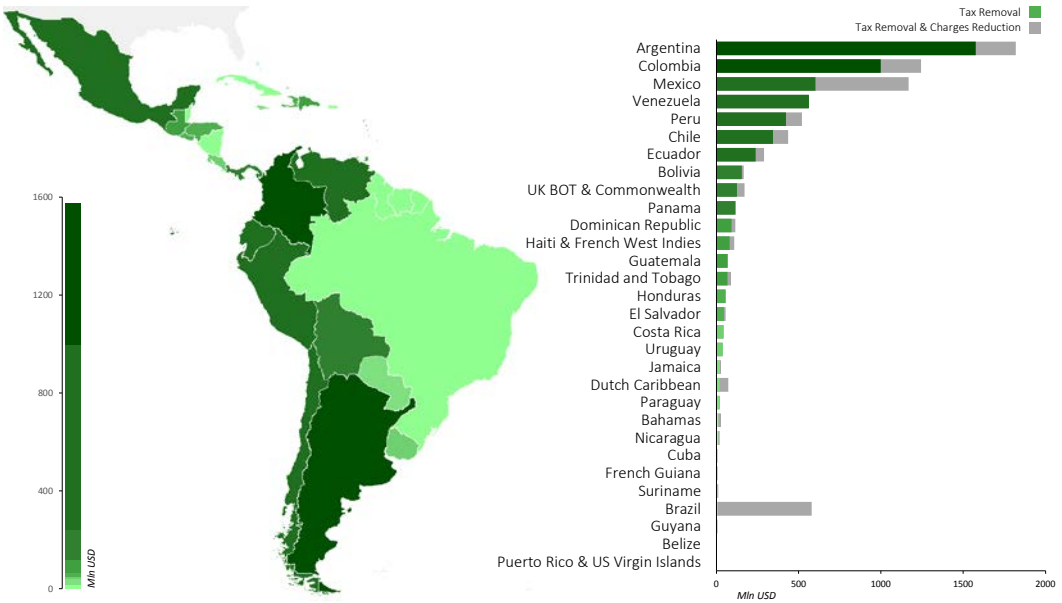
Table 7.2 In the 'Tax Removal and Charges Reduction' scenario total consumer benefits add up to $ 7.9 billion

		Business	Leisure	Total
'Tax Removal and charges reduction' scenario	Number of passengers residing in Latin America (thousands)	24,519	95,166	**119,685**
	Total consumer benefits (mln USD)	2,048	5,816	**7,864**
	Benefits per passenger (USD)	$84	$61	**$66**

Source: SEO NetCost

Figure 7.4 Total consumer benefits, if taxes were removed immediately, differ by country

Total consumer welfare benefits in both scenarios

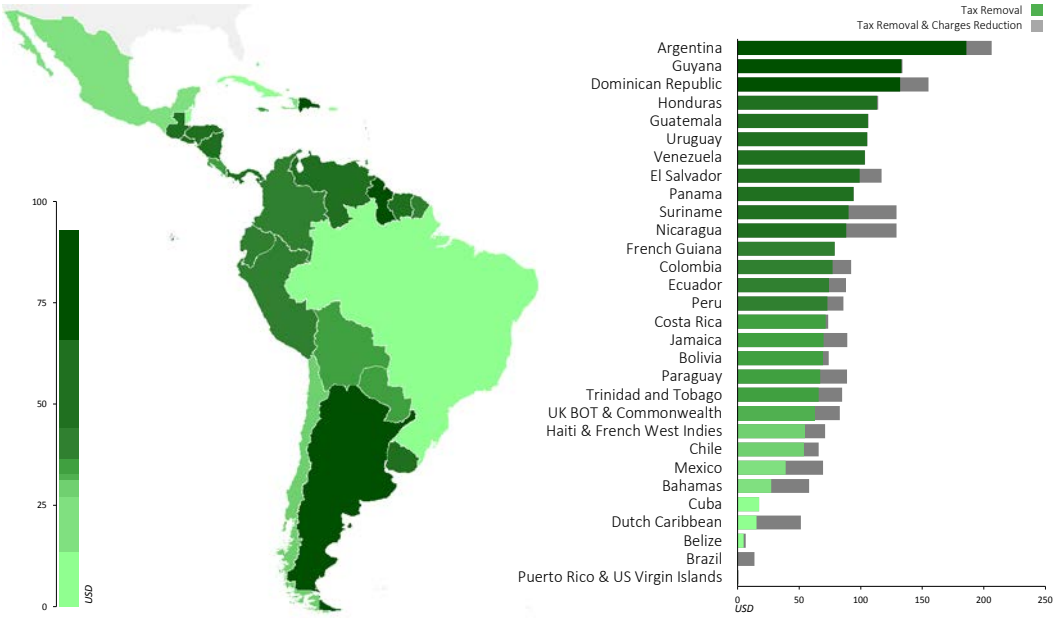


Source: SEO NetCost

Figure 7.4 shows the total direct consumer benefits per country. These benefits strongly differ by country. Differences are caused by the current level of taxes in the country as well as by the size of the aviation markets. Figure 7.5 gives the per passenger impacts. Chapters 9, 10 and 11 elaborate on the consumer benefits per sub-region and country for Central America and Mexico, the Caribbean and South America.

Figure 7.5 Total consumer welfare benefits per residential passenger fluctuate between $ 0 and $ 186 if taxes were removed immediately

Effects of both scenarios on welfare per residential passenger



Source: SEO NetCost

7.2.2 Total benefits

In addition to the consumer benefits, wider economic benefits may accrue through agglomeration effects and an increase in employment. These add up to $ 237 million in the 'Tax Removal' scenario, and to $ 306 million in the 'Tax Removal and Charges Reduction' scenario. The benefits through additional employment are estimated by the number of additional jobs multiplied by the average income tax burden per country. These add up to $ 769 million in the first scenario, and $ 1.24 billion in the second scenario.

Table 7.3 Total consumer benefits and wider economic benefits add up to $ 9.4 billion if all taxes are removed and passenger based charges are reduced

Total benefits (USD bln)	Tax Removal	Tax Removal and Charges Reduction
Direct consumer benefits	5.8	7.9
Agglomeration/productivity	0.2	0.3
Employment effects	0.8	1.2
Total	**6.8**	**9.4**

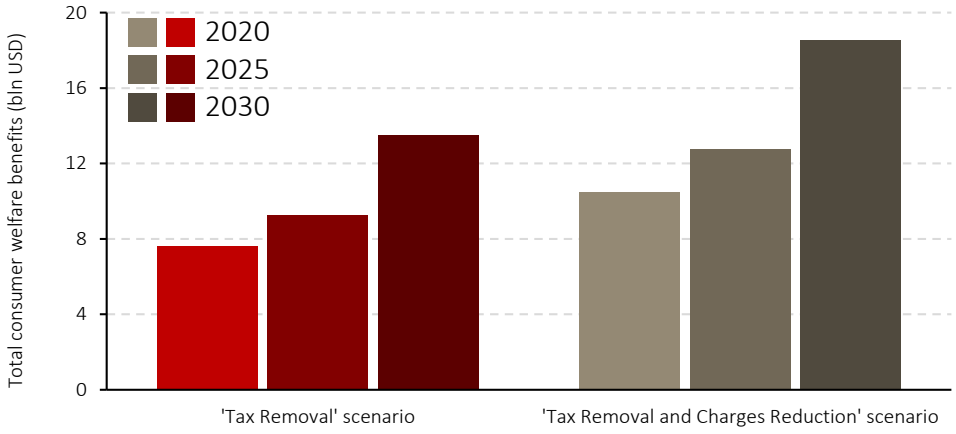
Source: SEO NetCost

7.3 Consumer benefits up to 2035

The aviation market in Latin America and the Caribbean has a strong growth potential (chapter 5). If taxes are removed and charges are reduced, more people will be able to fly in the future, in addition to the 'autonomous' market growth. As a result, more passengers will benefit from lower costs and increased connectivity, leading to higher consumer welfare benefits.

Figure 7.6 shows that the consumer benefits in 2035 add up to $ 13 billion in the scenario where all taxes are abolished. The benefits add up to $ 19 billion in the 'Tax Removal and Charges Reduction' scenario in 2035. In 2020, the removal of all taxes will lead to an aggregate consumer benefit of $ 8 billion. If, in addition, passenger based charges are reduced, the benefits will increase to $ 10 billion in 2020.

Figure 7.6 Consumer welfare benefits will add up to $ 19 billion in 2035 if all taxes are abolished and charges reduced



Source: SEO NetCost

'Tax Removal' scenario

Table 7.4 summarizes the results of the analysis for the 'Tax Removal' scenario in the horizon years 2020, 2025 and 2035. In this scenario, total consumer benefits add up to $ 7.6 billion in 2020, $ 9.3 billion in 2025 and $ 13.5 billion in 2035. This implies a respective per passenger benefit of $ 50, $ 48 and $ 49. These are the consumer benefits per Latin American passenger accrued through ticket price decreases and connectivity/frequency increases. The per passenger benefits slightly change over time. The main reason for this is that forecasted growth rates differ between domestic and international flights, leading to a different mix of flights. The consumer benefits differ for each flight. The effect of a tax decrease on air fares remains stable over time.

Table 7.4 Consumer benefits in the 'Tax Removal' scenario add up to $ 13 billion in 2035

	2020			2025			2035		
'Tax Removal' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in Latin America (mln)	33	121	**154**	40	151	**191**	59	219	**277**
Total benefits (mln USD)	2,094	5,525	**7,619**	2,547	6,711	**9,258**	3,723	9,770	**13,493**
Per passenger benefits	$64	$46	**$50**	$63	$45	**$48**	$64	$45	**$49**

Source: SEO NetCost

'Tax Removal and Charges Reduction'

If all passenger based charges are reduced to the level of the 25th percentile in the sub-region – the 'Tax Removal and Charges Reduction' scenario – consumer welfare benefits will accrue to $ 10.4 billion in 2020, $ 12.7 billion in 2025 and $ 18.5 billion in 2035 (see Table 7.5). Around 74 percent of these benefits are generated by leisure passengers. Per passenger benefits are higher for business passengers due to higher average air fares, adding up to $ 83 in 2020 and $ 82 in 2035.

One can observe that the passenger increase in the 'Tax Removal and Charges Reduction' scenario with respect to the first scenario is mainly caused by an increase in leisure passengers. Because passengers with a leisure motive are more price sensitive, a decrease in airfares leads to stronger market stimulation in the leisure segment.

Table 7.5 In the 'Tax Removal and Charges Reduction' scenario consumer benefits add up to $ 19 billion or $ 64 per passenger

	2020			2025			2035		
'Tax Removal and Charges Reduction' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in Latin America (mln)	33	128	**161**	41	159	**199**	59	230	**289**
Total benefits (mln USD)	2,728	7,729	**10,457**	3,323	9,401	**12,725**	4,853	13,685	**18,537**
Per passenger benefits	$83	$61	**$65**	$81	$59	**$64**	$82	$59	**$64**

Source: SEO NetCost

7.3.1 Total benefits

Total consumer benefits and wider economic benefits accumulate to $ 15 billion in the 'Tax Removal' scenario and to $ 21 billion in the 'Tax Removal and Charges Reduction' scenario in 2035.

In addition to the consumer benefits, wider economic benefits are generated through agglomeration and productivity effects and additional job creation. Wider economic benefits through agglomeration and productivity effects are estimated at 15 percent of the consumer welfare benefits for business passengers. In 2035, these add up to $ 0.6 billion in the 'Tax Removal' scenario, and to $ 0.7 billion in the 'Tax and Charges Removal' scenario.

Wider economic benefits through additional employment[27] are also expected to increase over time. As we do not have forecasts for employment in future years at our disposal, we assume that the

[27] Based on the employment estimates in chapter 8.

number of employees increases by the same rate as the population growth forecast (derived from the World Bank). In 2035, the consumer benefits from additional employment adds up to $ 0.9 billion in the 'Tax Removal' scenario and $ 1.5 billion in the 'Tax Removal and Charges Reduction' scenario.

Table 7.6 Consumer benefits and wider economic benefits of a removal of passenger based taxes and charges increase over time

	'Tax Removal'			'Tax Removal and Charges Reduction'		
Impacts (USD billion, undiscounted)	**2020**	**2025**	**2035**	**2020**	**2025**	**2035**
Consumer benefits	7.6	9.3	13.5	10.5	12.7	18.5
Agglomeration/productivity	0.3	0.4	0.6	0.4	0.5	0.7
Employment effects	0.8	0.9	0.9	1.3	1.4	1.5
Total	**8.8**	**10.5**	**15.0**	**12.2**	**14.6**	**20.7**

Source: SEO analysis

7.4 Cumulative benefits up to 2035

Cumulative agglomeration and productivity impacts add up to $ 4 billion in the 'Tax Removal' scenario and $ 6 million in the 'Tax Removal and Charges Reduction' scenario. Cumulative benefits from additional employment are estimated at $ 10-$ 16 billion in the two scenarios. This results in cumulative total benefits of $ 122 billion in the 'Tax Removal' scenario, and $ 170 billion in the 'Tax Removal and Charges Reduction' scenario (see Table 7.7). The total cumulative benefits have been discounted to present day values using a discount rate of 4.4 percent[28].

For the calculation of the cumulative consumer benefits, we assume that taxes (and charges, depending on the scenario) will gradually decline to zero until 2020. As such, the benefits are 0 in 2014, and equal to the values in the horizon years as presented in this chapter. Figure 7.7 shows the cumulative discounted benefits until 2035. Between 2014 and 2020 the benefits increase each year, due to the gradual decrease in taxes and charges. By 2035, the cumulative direct benefits add up to $ 122 billion in the 'Tax Removal' scenario and $ 170 billion in the 'Tax Removal and Charges Reduction' scenario.

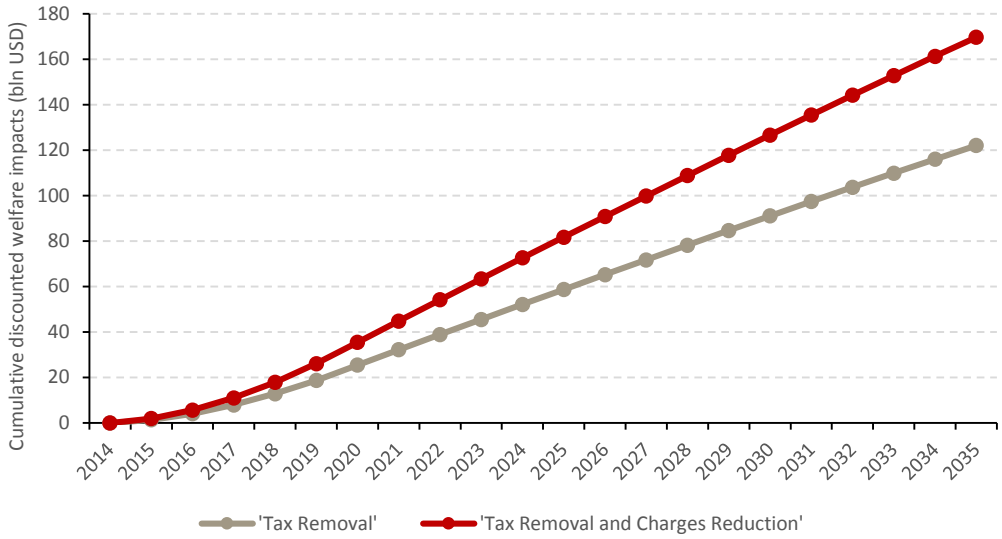
Table 7.7 Cumulative benefits (consumer benefits and wider economic benefits) add up to $ 170 billion over the period 2014-2035

Impacts (USD billion, discounted)	**'Tax Removal'**	**'Tax Removal and Charges Reduction'**
	2014-2035	2014-2035
Consumer benefits	108	148
Agglomeration/productivity	4	6
Employment effects	10	16
Total	**122**	**170**

Source: SEO analysis

[28] This discount rate is derived from Lopez (2008), who estimates the social discount rates for nine Latin America countries in four scenarios. The 4.4 percent discount rate follows from the average of the two intermediate scenarios.

Figure 7.7 Total cumulative benefits (consumer benefits and wider economic benefits) add up to $ 122 billion-$ 170 billion in the two scenarios



Source: SEO analysis

8 Macro-economic contribution of reducing aviation taxes

Removal of aviation taxes in Latin America and the Caribbean may potentially generate a GDP increase of $ 87 billion. If also passenger-based charges are reduced, we estimate the GDP benefit at $ 135 billion. In addition, we estimate the employment effects of the removal of aviation taxes at 912 thousand jobs, and 1.4 million jobs in case passenger-based charges are scaled back as well.

In this chapter, we discuss the changes in the economic contribution resulting from a removal of taxes and reduction of passenger-based charges, using the macro-economic approach. More specifically, we estimate the macro impact on GDP and employment. Furthermore, we consider the catalytic economic impact in terms of tourism, R&D/innovation, trade and investment.

8.1 Methodology

A fixed-effects panel data model has been used to estimate the macro-economic impacts on GDP at the country level. Panel data models allow for comparing the effects of change in air transport on the economy. The model analyses effects within countries over time, rather than analysing effects between different countries.

We use time-lag variables to correct for causality issues in the model. It is widely acknowledged that there is a two-way correspondence between air travel and economic growth. The relationship is bi-directional. To isolate the causal effect of air travel on GDP growth, we estimate the impact of a change in air passengers in the year *t-1* on the change in total GDP in year *t*. It is unlikely that GDP growth in a certain year impacts the growth in air travel in an earlier point in time. Hence, we estimate the effect of a change in air passengers or connectivity in a certain year on the change in the dependent economic variable in the year thereafter.

Log-values of the dependent variables and connectivity figures are used in our model. Therefore, the resulting coefficients can be interpreted as elasticities. For example, in a regression with GDP as the dependent variable, a coefficient of 0.1 for passenger numbers implies that a 10 percent increase in passengers in one year results in a 1 percent increase in GDP in the subsequent year.

The total GDP effect gives an indication of aggregate economic growth resulting from connectivity growth. The total GDP impact induced by connectivity growth can result from an increase in productivity and economic output, as well as through additional employment associated with aviation growth.

We have applied the estimated GDP and employment coefficients to forecast a net increase in GDP or employment figures using 2012 data – which is the most recent data available.

To estimate the impact of aviation on GDP and employment, we used international connectivity as an independent variable. This yielded more robust and statistically significant results than using

total – domestic and international – connectivity as an independent variable[29]. Although this analysis focuses on the relationship between international connectivity and economic growth, this does not imply that domestic connectivity does not contribute to this growth. Domestic connectivity is of major importance in connecting main economic centres of the country. Furthermore, domestic connections are important for airlines to operate hub-and-spoke networks in order to profitably operate a large international network.

In this chapter the impacts of decreasing aviation taxes and charges on GDP, employment and wider catalytic impacts are described. The regression results used for this analysis are shown in Appendix J.

The use of econometric analysis to estimate macro-economic impacts

There are different techniques for measuring the economic impact of airports. A frequently applied method is input-output analysis (I/O), which uses exogenously determined multipliers. It distinguishes between direct, indirect, induced and catalytic impact of air transport. The direct impact entails the employment and GDP associated with the operation and management of activities at the airports, including the airlines, ATC, ground handlers, security, maintenance, immigration and customs. The remainder of the impacts are indirect (generated by downstream industries that support and supply the activities at the airport), induced (economic activity and spending generated by employees of firms directly or indirectly related to the airport) and catalytic (facilitation of business of other sectors of the economy due to aviation).

The disadvantage of I/O is that it (partially) neglects the role of transport infrastructure as an intermediate good that leads to an increase of productivity and to cost savings at the downstream level (Malina & Wollersheim 2007), as well as labour market effects. As such, I/O based methodologies produce gross impacts, or the additional economic activity associated with aviation growth, but not the long-term, net impacts.

In this study, we use an econometric approach. One of the benefits of econometric analysis over I/O is that the former method is better able to measure the net impacts[30]: it estimates the impact on economic output for the entire economy, instead of estimating the impacts on economic activities associated directly or indirectly with aviation. The challenges for the econometric approach are on the other hand the requirement of long time series of reliable data and the treatment of causality/endogeneity. In addition, the econometric approach uses elasticities based on historical relationships. Hence, the econometric approach assumes stability of the relationships as found in the past, which may not necessarily be the case.

In this chapter, we present the GDP and employment impacts based on econometric analysis. For a detailed description of the methodology and regression results, we refer to Appendix J.

8.2 Macro-economic contribution of reducing aviation taxes

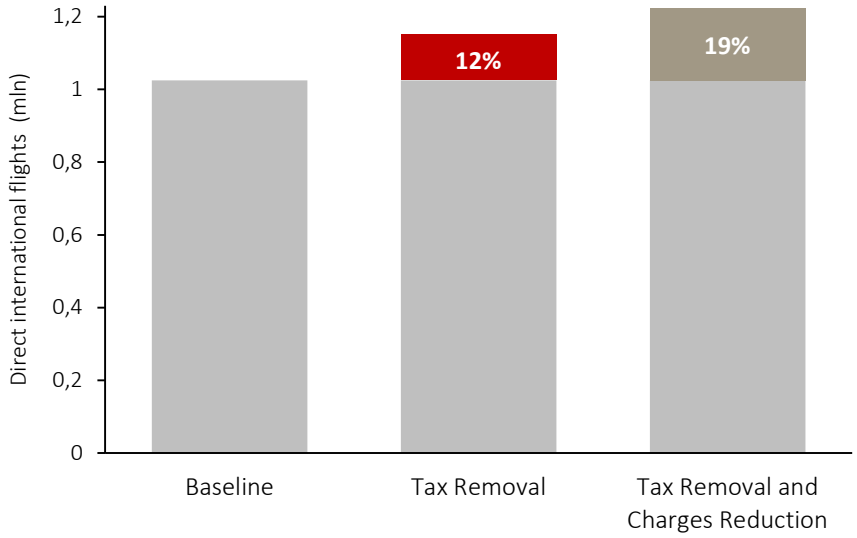
This section presents the macro-economic impact of the removal of aviation taxes. Removal of aviation taxes and passenger-based charges results in a stronger increase in passenger demand for Latin America and the Caribbean than the baseline. This is partly the result of lower airfares, which are passed through to the passengers, and partly due to rising connectivity levels, which bring down the time travel costs for passengers and again stimulate demand.

[29] A possible explanation is the fact that domestic connectivity shows much stronger fluctuations year-on-year, particularly for carriers operating small aircraft with a high frequency to connect rural areas to the main economic centres. Due to the low quality of landside infrastructure in numerous countries, domestic air connections are often the only travel alternative. In addition, there is a strong difference between countries in the supply of domestic connectivity. Some countries have no domestic connections, while for other countries domestic connectivity comprises the lion's share of the total connectivity.

[30] An approach that was also put forward by Button and Yuan (2011).

Using 2014 as base year in the 'Tax Removal' scenario, direct connectivity increases by 293 thousand or 8 percent. Focusing on international flights alone, this results in 124 thousand or a 12 percent increase in departures (see Figure 8.1). These numbers translate to an increase of 10 and 12 percent in total and international passengers respectively. In the 'Tax Removal and Charges Reduction' scenario the total amount of international flights and passengers will be respectively 19 and 17 percent higher than the baseline.

Figure 8.1 Removal of aviation taxes induces a 12 percent increase in international departures (direct connectivity) in Latin America and the Caribbean.



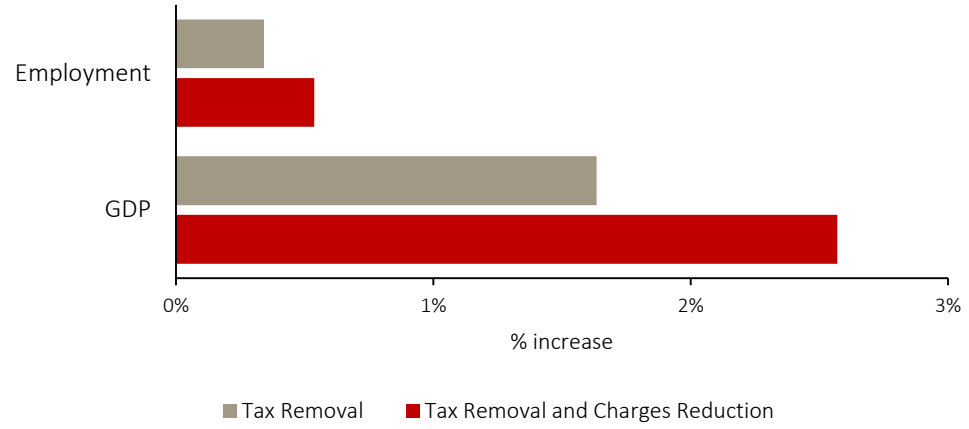
Source: SEO analysis

From the results of our panel data regression it follows that a 1 percent increase in direct international connectivity (approximately equivalent to direct flights) leads to a 0.13 percent increase in total net GDP at the country level.[31] Using this elasticity, we estimate that the 12 percent increase in international connectivity in the 'Tax Removal' scenario would lead to a 1.6 percent increase in total net GDP (see Figure 8.2). In the 'Tax Removal and Charges Reduction' scenario, the international connectivity increase with respect to the baseline is 19 percent. Using the same elasticities, this leads to a 2.5 percent GDP increase compared to the baseline.

Besides impacts on GDP, our panel data analysis also finds a significant effect for international connectivity on employment. During the period studied (between 2002 and 2012) a one percent increase in international connectivity has resulted in a 0.03 percent increase in employment at the country level. Relating this to the projected increase in international connectivity caused by the 'Tax Removal' scenario this leads to a 0.34 percent increase in employment on average. In the 'Tax Removal and Charges Reduction' scenario, employment increases by 0.53 percent.

[31] These results are in similar ranges as those of other studies. For example, PWC (2015) finds that a 1 percent growth in passengers results in a 0.1 percent GDP growth using econometric analysis. Poort (2000) using a three-stage least squares regression finds that a 1% growth in passenger enplanements leads to a 0.17 percent GDP growth in Europe. For employment, Bilotkach (2015) reports that a 1% growth in passengers leads to a 0.013 percent growth in employment in US metropolitan areas, using a panel data approach.

Figure 8.2 The impacts of 'Tax Removal' and 'Tax Removal and Charges Reduction' on GDP are 1.6 and 2.5 percent respectively for Latin America and the Caribbean.



Source: SEO analysis

8.2.1 Impact on GDP

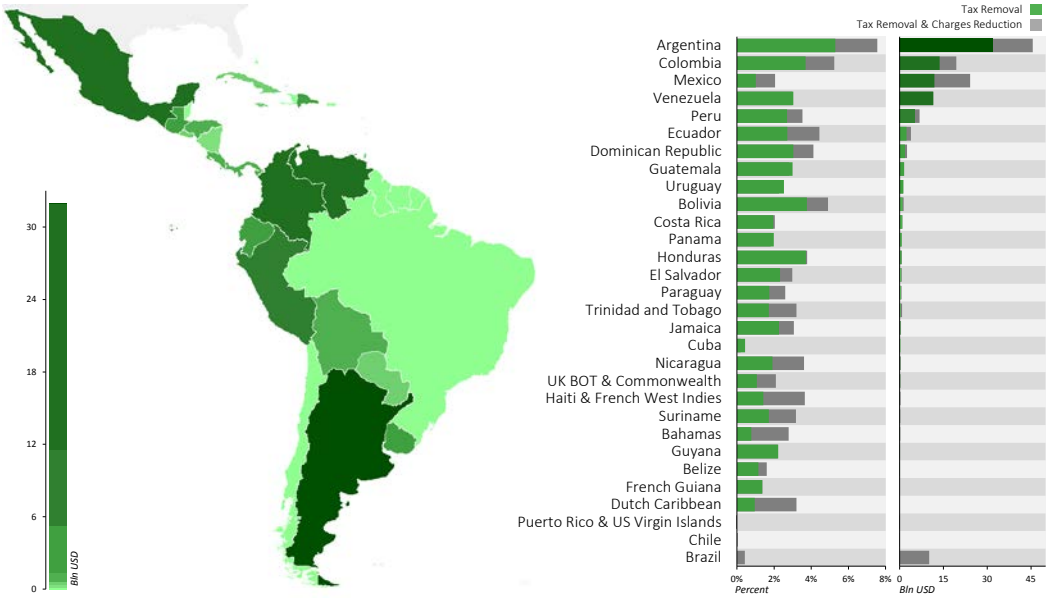
Figure 8.3 shows the estimated GDP contribution per country. Total GDP in Latin America increases by $ 87 billion in the 'Tax Removal' scenario. This amount increases to $ 135 billion in the 'Tax Removal and Charges Reduction' scenario. This amount includes net direct, indirect, induced and catalytic GDP benefits.

The largest benefits – in absolute terms – of the 'Tax Removal' scenario are realized in Argentina and Colombia, together accounting for 52 percent of the total GDP effect in the region. These countries both have relatively high aviation taxes, as well as a large share of the total GDP in Latin America. These two factors combined lead to large GDP impacts in both countries. Brazil, not levying any taxes on aviation passengers to remove, experiences no effect on its connectivity or GDP in the 'Tax Removal' scenario.

In the 'Tax Removal and Charges Reduction' scenario Brazil would experience a 0.4 percent increase in GDP, resulting in over $ 10 billion based on 2012 GDP levels. In this second scenario, Argentina continues being the largest benefiter, both in terms of relative and absolute growth.

Figure 8.3 Aviation taxes removal leads potentially to a GDP increase of $ 32 billion in Argentina

Absolute and relative effects of both scenarios on GDP



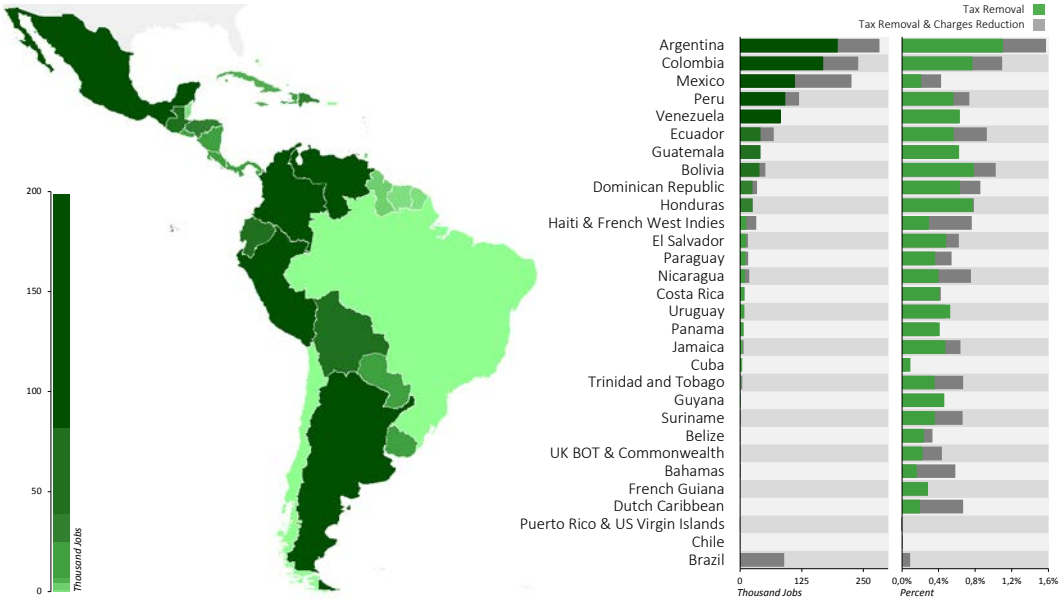
Source: SEO analysis based on World Bank data

8.2.2 Net impact on employment

The projection for total increase in net employment for the 'Tax Removal' is over 900 thousand jobs in Latin America and the Caribbean as a whole. We estimate that Argentina and Colombia will experience the highest absolute employment increase, with 198 thousand and 168 thousand jobs, respectively. In relative terms, Argentina shows by far the highest job impact with 1.1 percent, followed by Bolivia, Honduras and Colombia all close to 0.8 percent. Again, those countries with the highest aviation taxes stand to benefit the most, while countries such as Brazil and Chile show no effect at all since their taxes are already at the minimum level.

Figure 8.4 Argentina, Colombia and Mexico would gain the most jobs if taxes were removed

Absolute and relative effects of both scenarios on employment



Source: SEO analysis based on World Bank data

In the 'Tax Removal and Charges Reduction' scenario the amount of extra jobs created is maximized to 1.38 million. Compared to the previous scenario, Haiti and the French West Indies would benefit the most from a charge reduction in relative terms, projecting a job increase of 8 thousand by removing only taxes and 31 thousand by also reducing charges (Figure 8.5). Although the largest effects are projected for Argentina, Bolivia and Colombia all being above 1 percent, 18 out of the 30 territories included in the analysis show results between 0.5 and 1 percent increase in employment.

8.3 Decomposition of GDP impacts into productivity and employment growth

Total GDP impacts are realized through two different channels. Firstly, increased connectivity generates additional employment, leading to additional GDP output. Secondly, productivity of both existing and new employees increases due to better connectivity, yielding a higher GDP[32]. Relatively small productivity increases due to connectivity growth can have substantial effects, as they affect the average productivity of the entire labour force.

This mechanism is shown in Figure 8.5. In the baseline scenario, 286 million people are employed in Latin America, in which the total GDP equals $ 6,095 billion. This implies an average labour productivity of $ 21,323 per job. In the 'Tax Removal' scenario total GDP increases by 1.43

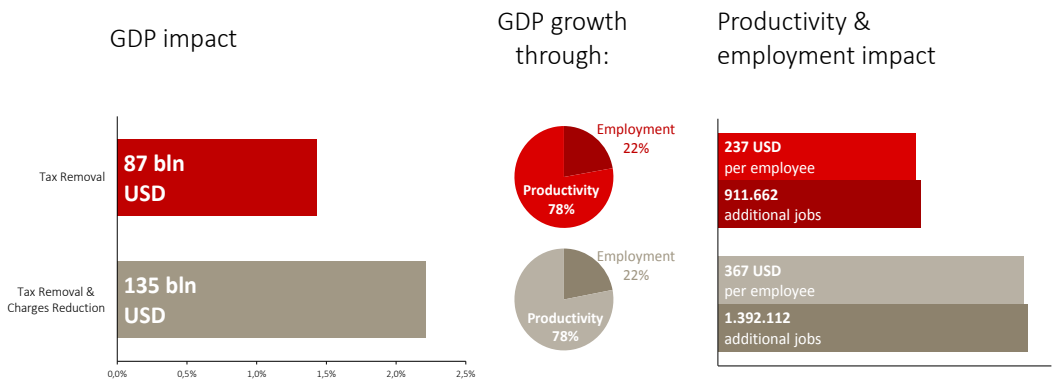
32 See also InterVISTAS (2015), reporting a GDP/capita growth of 0.5% for a 10% growth in a county's connectivity.

percent.[33] Based on the results of the employment regression, this results in an increase of 912 thousand jobs (a 0.32 percent increase). Combining the results of employment and GDP increase, we find that productivity increases by $ 237 per job, a 1.11 percent increase. The 912 thousand new employees all contribute $ 21,561 to the economy, leading to a GDP impact of $ 19.6 billion. In addition, the productivity of the existing 286 million working people increases by $ 237. This yields a GDP impact of $ 67.8 billion. These two components together add up to a total GDP impact of $ 87 billion in the 'Tax Removal' scenario.

In case of the 'Tax Removal and Charges Reduction' scenario, employment increases by 1.4 million (0.54 percent increase). The total GDP increase in this scenario amounts to $ 135 billion, an increase of 2.6 percent. Combining these results, a productivity increase of $ 367 per job can be derived, representing a 1.72 percent increase. The existing employees (286 million) become more productive, yielding a GDP impact of $ 105 billion. The 1.4 million additional employees contribute an additional $ 30 billion to GDP.

Appendix J provides a decomposition of the GDP impacts in productivity and employment growth per country.

Figure 8.5 GDP growth is realized through new employment as well as through productivity increase of the current labour force



Source: SEO

8.4 Wider catalytic impacts

Next to the macro-economic effects on employment and GDP, air connectivity appears to be an important driver of tourism, trade and innovation. We estimated the impacts of connectivity on FDI, R&D expenditure and tourism. Only for tourism, a strongly significant and positive relationship was found: a 10 percent increase in international connectivity leads to a 2.2 percent increase in the number of inbound tourists.

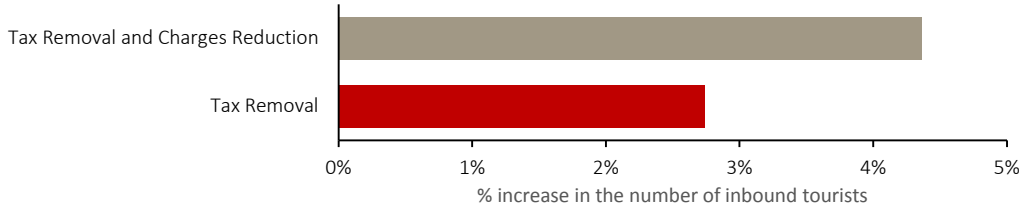
33 The relative increase of GDP and employment reported in Figure 8.5 differs from those reported in Figure 8.2. The former results are those obtained by adding up the GDP increase at country level, the latter results denote the average GDP increase of all countries.

8.4.1 Impact on tourism

A strong and positive impact was found for international connectivity growth on tourism. A 10 percent increase in international connectivity yields a 2.2 percent increase in the number of tourists. Many countries in Latin America and the Caribbean in particular are important tourist destinations. An increase in connectivity leads to shorter travel times, increasing the attractiveness of the country as a tourist destination. In addition, ticket prices may decrease as a result of increased connectivity due to a higher supply of seat capacity or an increase in competition.

Based on the cumulative relative increase in international connectivity, we find that a removal of taxes ('Tax Removal' scenario) leads to a 2.7 percent increase in the number of inbound tourists (Figure 8.6). If, in addition, passenger based taxes are also reduced ('Tax Removal and Charges Reduction' scenario), the number of tourists increases by 4.3 percent.

Figure 8.6 Abolishing all taxes and reducing charges leads to a 4.3 percent increase in the number of inbound tourists



Source: SEO

In 2013, there were a total number of 95.7 million inbound tourists in all Latin American countries. Abolishing all taxes is estimated to result in an increase of 2.5 million tourists. If, in addition charges were reduced, over 4 million additional tourists are welcomed. Based on average spending per tourist, this results in an increase in revenue from tourists of $ 1.48 billion in the 'Tax Removal' scenario and $ 2.15 billion in the 'Tax Removal and Charges Reduction' scenario.

8.4.2 Impact on Foreign Direct Investments and R&D expenditure

Access to extensive air transport links allows domestic firms to identify and manage investments in foreign-based assets and encourages foreign firms to invest in the domestic economy. Opening of new routes to Italian regions is associated with increases in Foreign Direct Investments in the years after the route opening (Bannò & Redondi 2014). For the UK, a 10 percent increase in offered seat capacity is associated with a 1.9 percent in FDI outflows and 4.7 percent FDI inflows (PWC 2014).

No significant correspondence was found between connectivity growth and the level of inward foreign direct investments as a share of GDP. Possibly inward FDI is more influenced by economic development in the creditor's country than in the country they want to invest in. It is conceivable that, when the Latin American and Caribbean economies move up the economic value chain, the link between connectivity and FDI will become more significant.

Improved air links foster effective networking and collaboration between companies and researchers in different parts of the world. Access to a greater number of markets and exposure to

foreign competition also stimulate R&D spending by companies, given the increased size of the potential market for future sales. According to the work of Hovhannisyan & Keller (2014), a 10 percent increase in business travel leads to an increase in patenting by about 0.2 percent, based on research in 37 industries in 34 countries, covering outward business travel from the United States. Baruffaldi (2015) finds that firms located in German regions where airline liberalization induced a higher level of interregional knowledge integration, innovative productivity increased significantly.

For Latin America and the Caribbean, we do not find a significant relationship between connectivity growth and R&D expenditure. It is possible that air travel more strongly induces R&D expenditure in more developed economies. It is likely when the Latin American and Caribbean economies move up the economic value chain, the role of aviation in fostering R&D will become more pronounced.

9 Economic benefits in Central America and Mexico

Tax removal in Central America and Mexico may generate a total discounted benefit of $ 24 billion up to 2035, which consists of consumer benefits and wider economic benefits. Tax removal can potentially deliver a GDP benefit of $ 16.5 billion and employment growth of 217 thousand jobs. If also passenger-based charges are reduced, the total discounted benefit will increase to $ 39 billion. We estimate potential GDP gains at $ 29 billion and employment gains at 344 thousand jobs in this scenario.

9.1 Consumer benefits

9.1.1 Immediate tax removal and charges reduction

'Tax Removal' scenario

Total consumer benefits in Central America and Mexico accrue to $ 947 million, in case taxes would be removed immediately. This leads to an average per passenger benefit of $ 49. About 28 percent of the total benefits are obtained by passenger travelling for business, leading to a per passenger benefit of $ 65 for these passengers. Benefits per leisure passengers are equal to $ 44.

Table 9.1 Total consumer benefits in Central America and Mexico add up to $ 947 million if taxes were removed immediately

		Business	Leisure	Total
	Number of passengers residing in Central America (thousands)	4,108	15,319	**19,427**
'Tax Removal' scenario	Total consumer benefits (mln USD)	268	679	**947**
	Benefits per passenger (USD)	$65	$44	**$49**

Source: SEO NetCost

'Tax Removal and Charges Reduction' scenario

If, in addition to a tax removal, charges were reduced as well, total benefits in Central America and Mexico accumulate to $ 1.5 billion. In the 'Tax Removal and Charges Reduction' scenario, per passenger benefits in Central America are $ 73, which is higher than in the other Latin American sub-regions. Passengers travelling for business have an average benefit of $ 96, compared to a benefit of $ 68 for leisure passengers.

Table 9.2 If taxes were removed and charges reduced, consumer benefits in Central America and Mexico add up to $ 1.5 billion

		Business	Leisure	Total
'Tax Removal and charges reduction' scenario	Number of passengers residing in Central America (thousands)	4,179	16,711	**20,890**
	Total consumer benefits (mln USD)	402	1,132	**1,535**
	Benefits per passenger (USD)	$96	$68	**$73**

Source: SEO NetCost

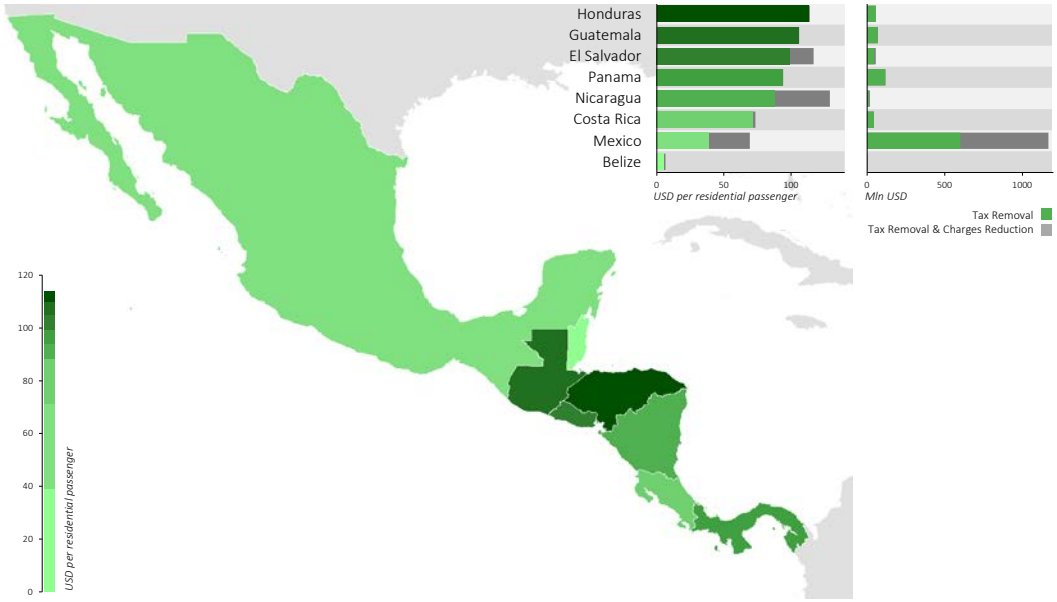
Results by country

In the 'Tax Removal' scenario, the total benefits in the sub-region are highest for Mexico ($ 602 million). 14.8 million departing passengers per year benefit from a removal of aviation taxes. In addition, lower airfares and increased connectivity lead to a 9 percent market stimulation. This leads to a total benefit of $ 39 per passenger. In the 'Tax Removal' scenario, the highest per passenger benefits are found in Honduras ($ 113 per passenger). Total benefits are highest in Mexico because its aviation market is much larger compared to other countries in the sub-region.

If, in addition to a tax removal, charges were reduced as well, total benefits for Mexico increase to $ 1.2 billion. Mexico accounts for 76 percent of the total benefits in the sub-region. As Mexican airports have a relatively high level of passenger based charges, consumer benefits are almost twice as high in the second scenario.

However, per passenger benefits are not highest in Mexico. The highest per passenger benefits in the 'Tax Removal and Charges Reduction' scenario are realized in Nicaragua ($ 129), El Salvador ($ 117) and Honduras ($ 114). In Nicaragua and Honduras a 15 percent sales or transportation tax is levied, El Salvador charges a 13 percent VAT on international air tickets. In addition, relatively high charges, ranging between $ 42 per return trip (Nicaragua) and $ 7.50 per return trip are in place. These are reduced to $6.28 in the 'Tax Removal and Charges Reduction' scenario.

Figure 9.1 The largest share of consumer benefits in Central America and Mexico is expected for Mexico



Source: SEO NetCost

Total benefits

A total benefit (consumer benefits and wider economic benefits) of $ 1.2 billion is estimated in the 'Tax Removal' scenario and a total benefit of $ 1.9 billion is estimated in the 'Tax Removal and Charges Reduction' scenario.

Additional wider economic benefits arise through agglomeration/productivity effects as well as through an increase in employment. For Central America and Mexico, the agglomeration effects

add up to $ 40 million in the 'Tax Removal' scenario and $ 60 million in the 'Tax Removal and Charges Reduction' scenario. Furthermore, 217 and 341 thousand jobs are created in both scenarios, leading to an additional benefit of $ 173-$ 311 million.

Table 9.3 Tax removal benefits in Central America and Mexico are estimated at $ 1.2 billion

Total benefits (mln USD)	Tax Removal	Tax Removal and Charges Reduction
Direct consumer benefits	947	1,535
Agglomeration/productivity	40	60
Employment effects	173	311
Total	**1,160**	**1,906**

Source: SEO

9.1.2 Consumer benefits up to 2035

'Tax Removal' scenario

In the 'Tax Removal' scenario, the number of passengers residing in Central America and Mexico is expected to increase from 29 million in 2020 to 58 million in 2035. Total consumer benefits in Central America and Mexico add up to $ 1.4 billion in 2020, and accumulate to $ 2.8 billion by 2035. Per passenger benefits remain constant at $ 48 over the years, as the level of tax reduction is assumed to be identical now and in future years.

Table 9.4 In 2035, tax removal in Central America and Mexico results in total consumer benefits of $ 2.8 billion

	2020			2025			2035		
'Tax Removal' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in Centr. Am & Mex (mln)	6	23	**29**	8	29	**37**	12	46	**58**
Total benefits (mln USD)	397	1,005	**1,402**	498	1,259	**1,757**	781	1,971	**2,752**
Per passenger benefits	$64	$44	**$48**	$64	$43	**$48**	$64	$43	**$48**

Source: SEO NetCost

'Tax Removal and Charges Reduction' scenario

In the 'Tax Removal and Charges Reduction' scenario, direct consumer benefits accrue to $ 2.3 billion in 2020 and $ 4.5 billion in 2035, implying a per passenger benefit of around $ 72. The per passenger benefit in 2035 is slightly lower than in earlier years, which is caused by changes in traffic mix, between which the consumer benefits per passenger differ.

Table 9.5 Removal of taxes and reduction of charges yields direct consumer benefits of $ 4.5 billion in Central America and Mexico in 2035

	2020			2025			2035		
'Tax Removal and Charges Reduction' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in Centr. Am & Mex (mln)	6	25	**31**	8	32	**40**	12	50	**62**
Total benefits (mln USD)	597	1,679	**2,276**	747	2,097	**2,844**	1,171	3,287	**4,459**
Per passenger benefits	$95	$67	**$72**	$94	$66	**$72**	$94	$66	**$72**

Source: SEO NetCost

Total consumer and wider economic benefits

The total consumer and wider economic benefits in Central America and Mexico in 2035 accumulate to $ 3.1 billion in the 'Tax Removal' scenario. In the 'Tax Removal and Charges Reduction' scenario, total benefits add up to $ 5.0 billion.

The agglomeration effects increase over time as the number of business passengers increases. In the 'Tax Removal' scenario, these effects increase from $ 60 million in 2020 to $ 117 million in 2035 and from $ 90 million in 2020 to $ 176 million in 2035 in the 'Tax Removal and Charges Reduction' scenario. Benefits from additional employment are also expected to increase over time. In 2035, these impacts accrue to $ 213 million in the 'Tax Removal' scenario and to $ 383 million in the 'Tax Removal and Charges Reduction' scenario.

Table 9.6 Total consumer and wider economic benefits in Central America and Mexico range between $ 3.1 billion and $ 5.0 billion, depending on the scenario

	'Tax Removal'			'Tax Removal and Charges Reduction'		
Impacts (USD million, undiscounted)	**2020**	**2025**	**2035**	**2020**	**2025**	**2035**
Consumer benefits	1,402	1,757	2,752	2,276	2,844	4,459
Agglomeration/productivity	60	75	117	90	112	176
Employment effects	186	196	213	335	353	383
Total	**1,647**	**2,028**	**3,082**	**2,701**	**3,309**	**5,017**

Source: SEO NetCost

9.1.3 Cumulative impacts up to 2035

In the 'Tax Removal' scenario, the discounted cumulative impacts add up to $ 24 billion over the period 2014-2035. The greatest share of these impacts are generated through direct consumer benefits. Wider economic benefits through agglomeration effects sum up to $ 0.9 billion, whereas additional employment leads to a benefit of $ 2.2 billion. In the 'Tax Removal and Charges Reduction' scenario, the results are higher, adding up to a total benefit of $ 39 billion for the period 2014-2035.

Table 9.7 Cumulative benefits until 2035 in Central America and Mexico add up to $ 39 billion in the 'Tax Removal and Charges Reduction' scenario

Impacts (USD billion, discounted)	**'Tax Removal'**	**'Tax Removal and Charges Reduction'**
	2014-2035	2014-2035
Consumer benefits	20.8	33.7
Agglomeration/productivity	0.9	1.3
Employment effects	2.2	4.0
Total	**24**	**39**

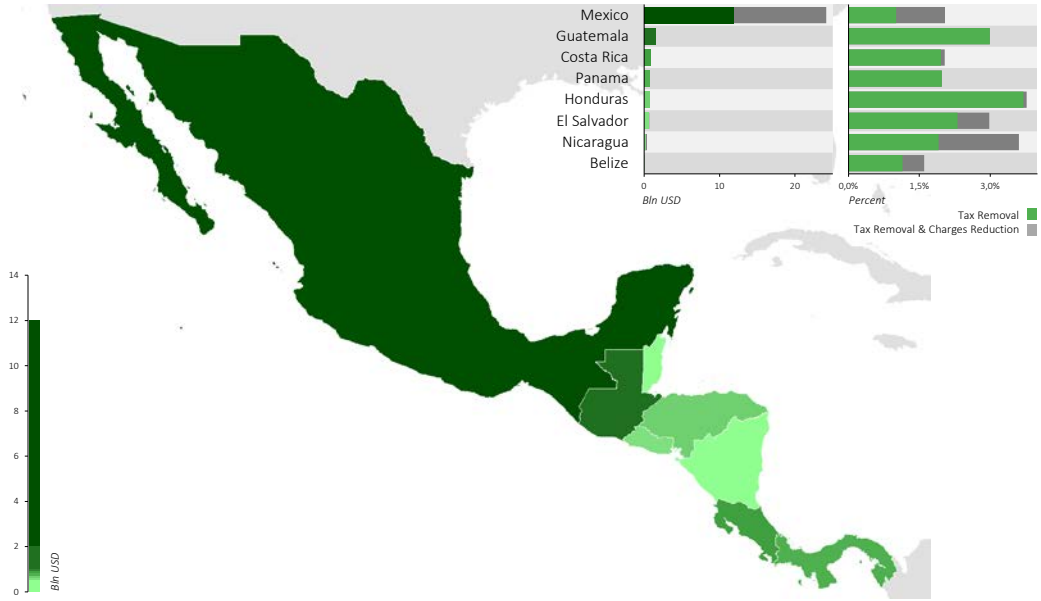
Source: SEO NetCost

9.2 Macro-economic impacts

9.2.1 Impacts on GDP

We estimate that the 'Tax Removal' scenario could generate around $ 17 billion of GDP in Central America and Mexico. If passenger-based charges are reduced as well, this amount will increase to $ 29 billion.

Figure 9.2 The relative impacts of removing aviation taxes on GDP are largest in Honduras



Source: SEO

In absolute terms, the GDP effects of removing aviation taxes are highest in Mexico due to the size of its economy compared to other Central American countries, with an estimated increase of $ 12 billion. However, Honduras shows the greatest benefit from tax removal in relative terms, with a GDP effect of 3.7 percent, followed by Guatemala with 3.0 percent and El Salvador with 2.3 percent. In Mexico and Belize, the countries with the lowest relative impacts, the removal of aviation taxes would still result in a GDP increase of 1 and 1.1 percent respectively (Figure 9.2).

Reducing aviation charges on top of a removal of taxes is estimated to result in a significant GDP effect for some countries in the sub-region. The largest relative increase can be found in Nicaragua and Mexico, with a GDP increase of $ 378 million and $ 24 billion, respectively. Given the already low aviation charges in Guatemala, Honduras, Costa Rica and Panama, the effect of this scenario is limited for these countries (Figure 9.3).

9.2.2 Impacts on employment

Employment in Central America and Mexico could benefit significantly from a removal of aviation taxes and a reduction of charges. Within the whole sub-region, we estimate an increase of 217 thousand jobs in the 'Tax Removal' scenario. Similarly, the introduction of the 'Tax Removal and Charges Reduction' scenario could lead to an employment increase of 344 thousand jobs.

Figure 9.3 The 'Tax Removal and Charges Reduction' scenario would generate the highest increase in employment in Honduras and Nicaragua

Source: SEO

The absolute effect of the 'Tax Removal' scenario is largest in Mexico, with a net increase of over 110 thousands jobs, which is equivalent to a 0.2 percent increase. Mexico is followed by Guatemala and Honduras, where the increase in jobs results in 41 thousand and 25 thousand, respectively. In relative terms, these two countries show the largest employment effect with 0.8 and 0.6 percent growth, respectively.

The implementation of the 'Tax Removal and Charges Reduction' scenario would result in higher employment effects in all countries except Guatemala, Honduras, Costa Rica and Panama. Due to the high aviation charges levied in Nicaragua, the employment effect almost doubles in this scenario to 19 thousand extra jobs. Mexico and El Salvador could benefit from a significant amount of additional employment by lowering their aviation charges, with 226 thousand and 16 thousand jobs, respectively (Figure 9.3).

9.2.3 Impacts on tourism

In our model, the reduction of airplane tickets would have significant positive effects of tourism for Central American countries and Mexico. We estimate an effect of more than 800 thousand tourist for the region in the 'Tax Removal' scenario, a number which rises to almost 1.3 million in the 'Tax Removal and Charges Reduction' scenario. Figure 9.4 shows the predicted effects on tourism for each individual country.

Figure 9.4 Honduras and Guatemala would experience the highest relative increase in tourism

Source: SEO

As can be seen (figure 9.4), all countries show a relative increase close to or above 2 percent in the 'Tax Removal' scenario. We predict the highest relative growth for Honduras and Guatemala, with an increase of 6.2 and 5 percent or 54 thousand and 100 thousand tourists, respectively.

If, additionally to removing aviation taxes, aviation charges are reduced as per the 'Tax Removal and Charges Reduction' scenario, the estimated effect on tourism for certain countries would increase further. For Mexico and Nicaragua, the effect would more than double, reaching 3.4 percent and 6 percent respectively; and, with that, the latter country's effect comes close to that experienced in Honduras, the best performing country in the list. Further, the implementation of this second scenario would lead to higher increases in tourism in El Salvador and Belize, reaching 5 percent and 2.7 percent, respectively (figure 9.4).

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10 Economic benefits in the Caribbean

Tax removal in the Caribbean may generate a total discounted benefit of $ 8 billion up to 2035, which includes consumer and wider economic benefits. Tax removal can potentially deliver a GDP benefit of $ 3.2 billion and employment growth of 51 thousand jobs. If also passenger-based charges are reduced, the total discounted benefit will increase to $ 12 billion. We estimate potential GDP gains at $ 4.9 billion and employment gains at 85 thousand jobs.

10.1 Consumer benefits

10.1.1 Immediate tax removal and charges reduction

'Tax Removal' scenario

Removal of aviation taxes in the Caribbean is estimated to result in a total consumer benefit of $ 426 million. Based on a total of 8.8 million residential passengers in the Caribbean, this implies a per passenger benefit of $ 48 per return trip. Benefits for passengers travelling for business are on average $ 60 per return trip, compared to $ 45 per trip for leisure passengers.

Table 10.1 Consumer benefits of an immediate removal of taxes accumulates to $ 426 million in the Caribbean

		Business	Leisure	Total
'Tax Removal' scenario	Number of passengers residing in the Caribbean (thousands)	1,926	6,951	**8,877**
	Consumer benefits (mln USD)	116	310	**426**
	Benefits per passenger (USD)	$60	$45	**$48**

Source: SEO NetCost

'Tax Removal and Charges Reduction' scenario

If, in addition, passenger-based charges were reduced, direct consumer benefits accrue to $ 624 million. This leads to an increase of $ 19 to the per passenger benefit with respect to the first scenario. Per passenger benefits are on average $ 83 for passengers travelling for business and $ 63 for leisure passengers.

Table 10.2 An immediate removal of taxes and reduction of charges leads to a consumer benefit of $ 624 million in the Caribbean

		Business	Leisure	Total
'Tax Removal and charges reduction' scenario	Number of passengers residing in the Caribbean (thousands)	1,946	7,348	**9,295**
	Consumer benefits (mln USD)	162	462	**624**
	Benefits per passenger (USD)	$83	$63	**$67**

Source: SEO NetCost

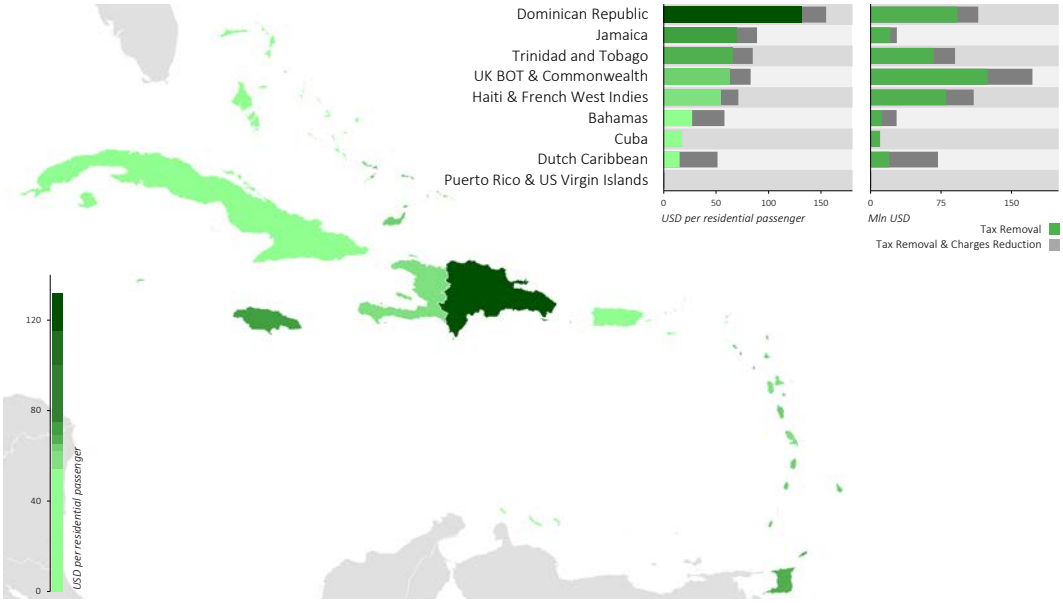
Results by country

Total consumer benefits are highest for the UK BOT and Commonwealth in both scenarios. This is the second largest aviation market in the region – behind Puerto Rico & US Virgin Islands – with 4.9 million passengers in the base year 2014. A removal of taxes leads to a direct consumer benefit of $ 124 million in this region. The second and third highest benefits in the 'Tax Removal' scenario are obtained in the Dominican Republic and Haiti & French West Indies.

Per passenger benefits are highest for the Dominican Republic, where taxes are relatively high. In particular the removal of the 18 percent transportation tax leads to high consumer benefits, as this implies a reduction of 18 percent of the air fare. Jamaica has the second highest per passenger benefits.

In the 'Tax Removal and Charges Reduction' scenario, total consumer benefits strongly increase in the Dutch Caribbean. The Dutch Caribbean has relatively high passenger-based charges, in combination with a low tax level. Consumer benefits add up to $ 72 million.

Figure 10.1 Highest consumer benefits are obtained in the UK BOT and Commonwealth, while per passenger benefits are highest in the Dominican Republic



Source: SEO NetCost

Total consumer and wider economic benefits

Total consumer and wider economic benefits of $ 472 million and $ 688 million are generated in the 'Tax Removal' and the 'Tax Removal and Charges Reduction' scenario, respectively. In addition to direct consumer benefits, wider economic benefits arise through agglomeration and employment effects. The agglomeration/productivity benefits are estimated at $ 17 million in the 'Tax Removal' scenario and $ 24 million in the 'Tax Removal and Charges Reduction' scenario. Wider economic benefits through additional employment are estimated at respectively $ 29 million and $ 40 million.

Table 10.3 Total consumer and wider economic benefits for the Caribbean are estimated at $ 472 million in the 'Tax Removal' scenario and $ 688 million in the 'Tax Removal and Charges Reduction' scenario

Total benefits (mln USD)	Tax Removal	Tax Removal and Charges Reduction
Direct consumer benefits	426	624
Agglomeration/productivity	17	24
Employment effects	29	40
Total	**472**	**688**

Source: SEO NetCost

10.1.2 Consumer benefits up to 2035

In 2035, total consumer benefits in the 'Tax Removal' scenario are estimated at $ 850 million and $ 1.2 billion in the 'Tax Removal and Charges Reduction' scenario (Table 10.4 and Table 10.5). Total discounted benefits over the period 2014-2035 add up to $ 8 billion and $ 12 billion in the 'Tax Removal' and 'Tax Removal and Charges Reduction' scenarios, respectively (Table 10.7).

Until 2035, passenger traffic is expected to grow significantly in the Caribbean. Total number of departing passengers from the Caribbean – residing in one of the Caribbean countries – is expected to increase to 17 million in 2035. This growth also means that more consumers and businesses will benefit from lower travel costs if charges and/or taxes are reduced, in comparison to a 'do nothing' scenario.

Table 10.4 Consumer benefits add up to $ 850 million in 2035 in the Caribbean if taxes were removed

	2020			2025			2035		
'Tax Removal' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in the Caribbean (mln)	3	9	**12**	3	10	**13**	4	13	**17**
Total benefits (mln USD)	155	414	**570**	177	471	**648**	232	618	**850**
Per passenger benefits	$62	$45	**$49**	$62	$46	**$49**	$63	$46	**$50**

Source: SEO NetCost

Table 10.5 In the 'Tax Removal and Charges Reduction' scenario consumer benefits in the Caribbean accumulate to $ 1.2 billion

	2020			2025			2035		
'Tax Removal and Charges Reduction' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in the Caribbean (mln)	3	10	**12**	3	11	**14**	4	14	**18**
Total benefits (mln USD)	215	613	**827**	244	695	**939**	319	907	**1,225**
Per passenger benefits	$84	$64	**$68**	$84	$64	**$68**	$85	$64	**$69**

Source: SEO NetCost

Table 10.6 Agglomeration/productivity and employment benefits result in an additional 8 percent of benefits, on top of consumer benefits, in the 'Tax Removal' scenario

	'Tax Removal'			'Tax and Charges Removal'		
Impacts (USD million, undiscounted)	**2020**	**2025**	**2035**	**2020**	**2025**	**2035**
Consumer benefits	570	648	850	827	939	1,225
Agglomeration/productivity	23	27	35	32	37	48
Employment effects	30	31	32	42	44	46
Total	623	705	917	901	1,019	1,318

Source: SEO NetCost

Table 10.7 Cumulative, discounted benefits in the 'Tax Removal' scenario add up to $ 8 billion over the period 2014-2035

Impacts (USD billion, discounted)	**'Tax Removal'**	**'Tax Removal and Charges Reduction'**
	2014-2035	2014-2035
Consumer benefits	7.5	10.8
Agglomeration/productivity	0.3	0.4
Employment effects	0.3	0.5
Total	**8**	**12**

Source : SEO NetCost

There are substantial differences in benefits between the individual countries in the Caribbean. The differences between the countries depend mainly on the future sizes of the aviation markets of the individual countries as well as their taxes and charges regimes. The differences between the various countries in 2035 are in line with those for the immediate consumer welfare benefits (section 10.1.1) and have been reported in detail in Appendix H.

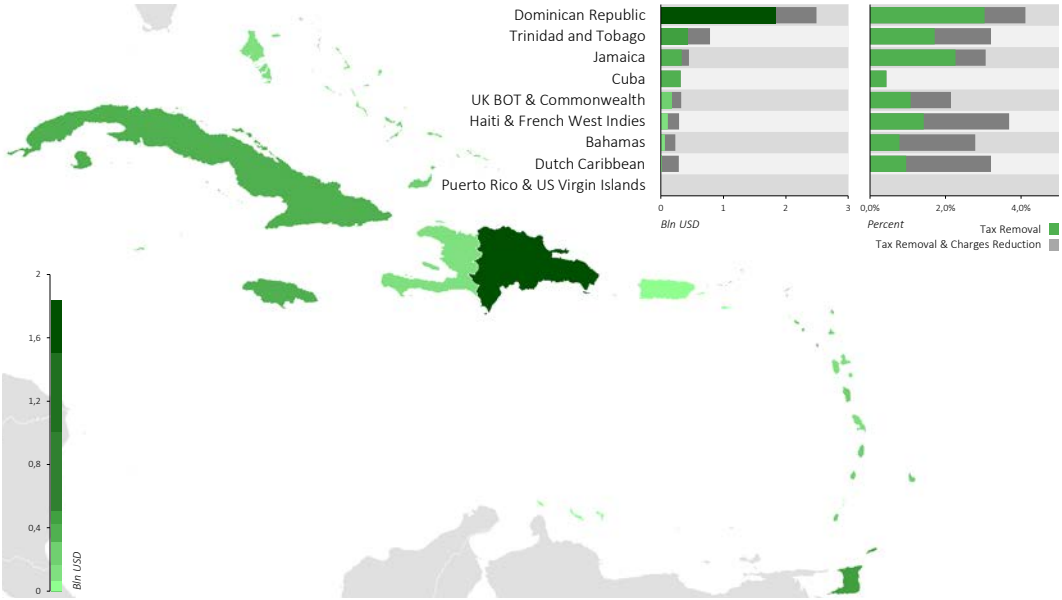
10.2 Macro-economic impacts

10.2.1 Impacts on GDP

Using the results from the panel data analysis (see Chapter 8), we have estimated the GDP and employment impacts for the different economies in the Caribbean. We estimate the total, immediate GDP increase in South America in the 'Tax Removal' scenario, using 2012 GDP figures, at $ 3.2 billion, in comparison to the baseline. This represents a 1.6 percent GDP increase. This number rises to $ 4.7 billion and 2.3 percent in the 'Tax Removal and Charges Reduction' scenario (Appendix I).

Removal of aviation taxes and passenger-based charges results in a stronger increase in passenger demand for the Caribbean, in comparison to the baseline. This is partly the result of lower airfares, which are passed through to the passengers, and partly due to rising connectivity levels, which bring down the time travel costs for passengers and again stimulate demand.

Figure 10.2 Relative GDP increase in the 'Tax Removal' scenario highest in Dominican Republic, Trinidad and Tobago and Jamaica



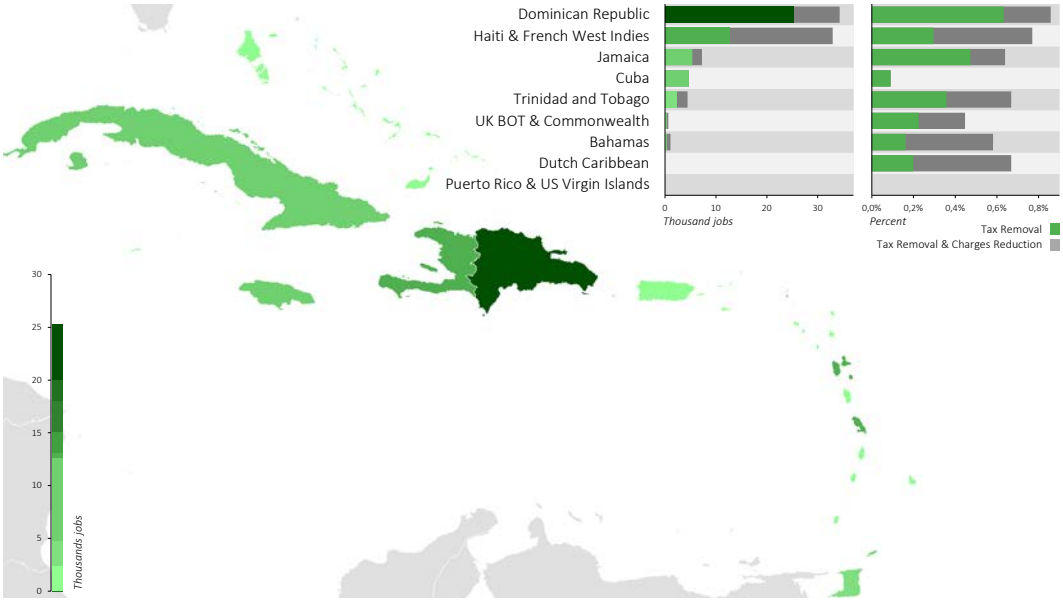
Source: SEO

As Figure 10.2 shows, largest absolute GDP impacts are estimated for the Dominican Republic, Trinidad and Tobago and Jamaica in the 'Tax Removal' scenario. In the 'Tax Removal and Charges Reduction' scenario, the same three countries gain most GDP in absolute terms. In relative terms, also Haiti & French West Indies, Dutch Caribbean and the Bahamas will potentially benefit from strong relative GDP growth. Impacts in Puerto Rico & US Virgin Islands are very limited in both scenarios. These countries currently have a very low level of taxes and charges.

10.2.2 Impacts on employment

In terms of employment impacts, we estimate the potential job impact of a removal of taxes in the Caribbean at 51 thousand jobs in the 'Tax Removal' scenario and 82 thousand jobs in the 'Tax Removal and Charges Reduction' scenario (Appendix I).

Figure 10.3 Dominican Republic, Haiti & French West Indies, and Jamaica benefit most from employment in growth in absolute terms if taxes are removed



Source: SEO

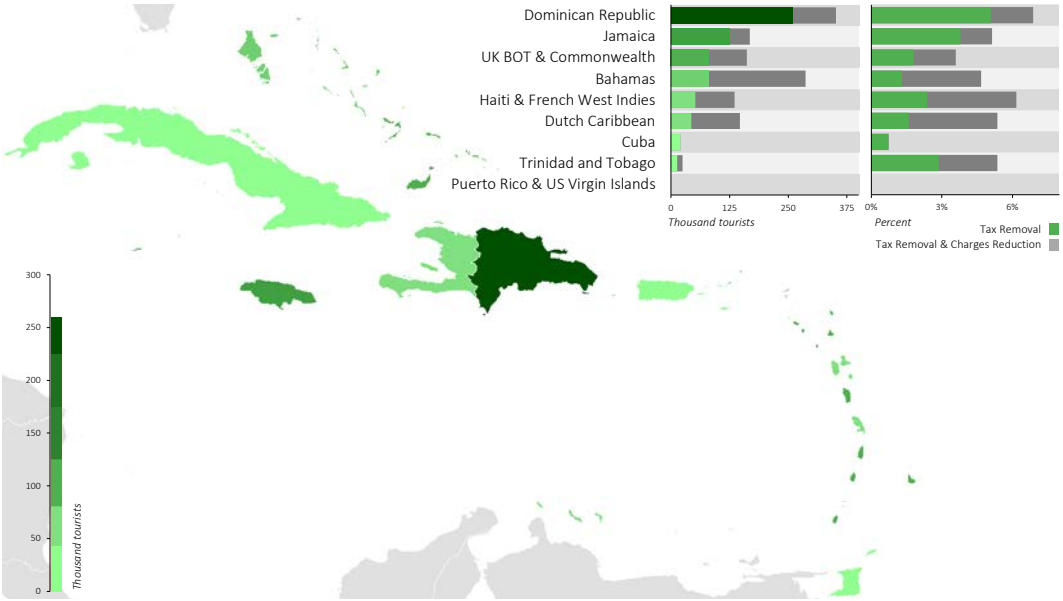
There are substantial differences between the various economies. Differences are rather similar to those concerning the GDP impacts. We estimate the potential employment growth to be largest in absolute terms in the Dominican Republic, Haiti & French West Indies and Jamaica in both scenarios. When taxes are removed, in relative terms growth rates are also substantial in Trinidad and Tobago, UK BOT and Commonwealth and the Dutch Caribbean.

10.2.3 Impacts on tourism

In the Caribbean, the 'Tax Removal' scenario is estimated to have a significant positive effect on tourism, resulting in 675 thousand extra tourist for the whole region. If, additionally, charges are reduced in accordance with the 'Tax Removal and Charges Reduction' scenario, our estimation increases to almost 1.3 million additional tourists. Figure 10.4 displays the effects of both scenarios on tourism for each individual country or group of countries in the region.

In absolute terms, we expect the increase in the amount of tourist due to the removal of aviation taxes to be highest in the Dominican Republic with almost 260 thousand, followed by Jamaica with 124 thousand (figure 10.4). This is also the case in relative terms, with a 5.1 and 3.8 percent increase, respectively. For both the UK BOT & Commonwealth and the Bahamas we estimate an increase of more than 80 thousand tourists, or 1.8 and 1.3 percent, respectively. Also, tourism numbers in Trinidad and Tobago, Haiti & the French West Indies and the Dutch Caribbean are expected increase significantly in the 'Tax Removal' scenario with 2.9 percent, 2.4 percent and 1.6 percent, respectively. In Cuba, where aviation taxes are comparatively low, and in Puerto Rico & the US Virgin Islands where none are levied at all the effects are expected to be small or negligible.

Figure 10.4 The impact on tourism is by far the highest in the Dominican Republic



Source: SEO

With the exception of Cuba and Puerto Rico & the US Virgin Islands the expected effects increase further in the 'Tax Removal and Charges Reduction' scenario (figure 10.4). In Haiti & the French West Indies, the Dutch Caribbean and the Bahamas this increment is the largest, all increasing with more that 3 percent with respect to the estimated results in the previous scenario.

11 Economic benefits in South America

Tax removal in South America may generate a total discounted welfare benefit of $ 90 billion up to 2035, which consists of consumer benefits and wider economic benefits. Tax removal can potentially deliver a GDP benefit of $ 68 billion and employment growth of 644 thousand jobs. If also passenger-based charges are reduced, the total discounted benefit increases to $ 119 billion. We estimate potential GDP gains at $ 101 billion and employment gains at 962 thousand jobs.

11.1 Consumer benefits

11.1.1 Immediate tax removal and charges reduction

'Tax Removal' scenario

Aggregate consumer benefits in South America may add up to $ 4.4 billion if taxes were removed. This accounts for 76 percent of the total consumer benefits estimated for Latin America and the Caribbean. This is mainly due to the large passenger market in this sub-region.

Consumer benefits per passenger in South America are higher than in the other two sub-regions in the 'Tax Removal' scenario, with $ 51 per passenger. This is caused by very high taxes in some countries. Per passenger benefits are particularly high for Argentina ($ 186), Guyana ($ 133) and Uruguay ($ 105). In Argentina, a 35 percent 'Retention Income Tax' and a 5 percent Ticket Tax is charged. Hence, tax removal may add up to a relatively large sum of money, especially for long haul flights. High per passenger benefits are also observed for other countries with high taxes levied as a percentage of the ticket price, such as Guyana (15 percent sales tax).

Table 11.1 Consumer benefits for South America add up to $ 4.4 billion in the 'Tax Removal' scenario

		Business	Leisure	Total
'Tax Removal' scenario	Number of passengers residing in South America (thousands)	18,247	68,284	**86,531**
	Total consumer benefits (mln USD)	1,193	3,186	**4,379**
	Benefits per passenger (USD)	$65	$47	**$51**

Source: SEO NetCost

'Tax Removal and Charges Reduction' scenario

If also passenger-based charges are reduced in South America, total consumer benefits will increase to $ 5.7 billion at an average per passenger benefit of $ 64. Again, per passenger benefits are high for Argentina and Uruguay, but also for Suriname with a relatively high passenger-based charges level.

Table 11.2 Consumer benefits for South America add up to $ 5.7 billion in the 'Tax Removal and Charges Reduction' scenario

		Business	Leisure	Total
'Tax Removal and charges reduction' scenario	Number of passengers residing in Latin America (thousands)	18,394	71,106	**89,500**
	Total consumer benefits (mln USD)	1,484	4,222	**5,706**
	Benefits per passenger (USD)	$81	$59	**$64**

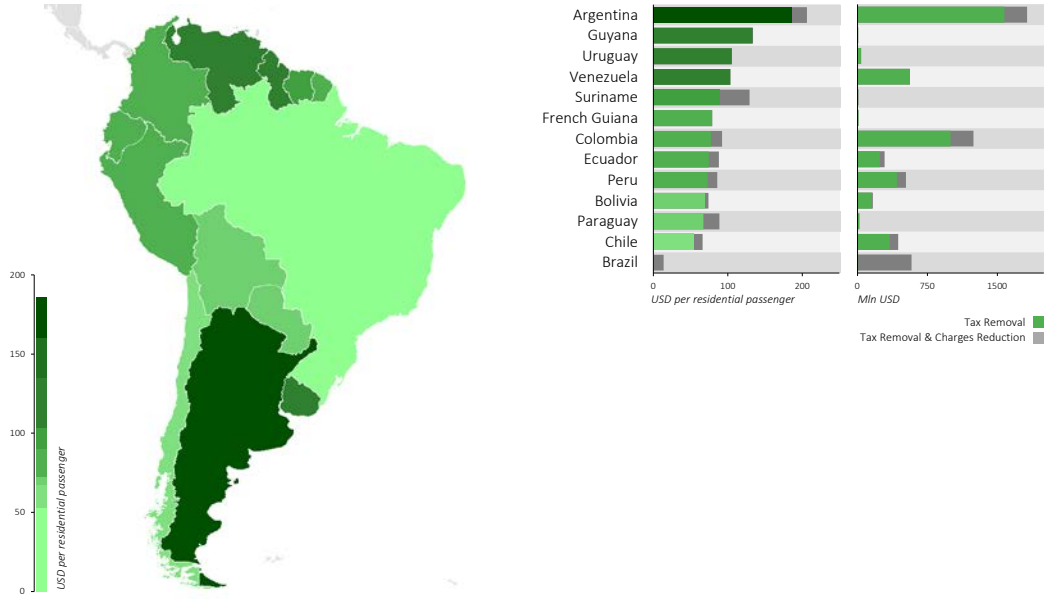
Source: SEO NetCost

Results by country

Total consumer benefits strongly differ by country (Figure 11.1). In the 'Tax Removal' scenario the total benefits are highest for Argentina ($ 1.6 billion) and Colombia ($ 1.0 billion). These countries have the highest tax burden and have a fairly large aviation market, with respectively 13 million, 20 million and 39 million departing passengers per year. These passengers all benefit from a decrease in ticket prices and increased connectivity. In addition, tax removal results in market stimulation.

Per passenger benefits are highest for countries which have a high tax burden, in particular when taxes are levied as a share of the ticket price. Argentina shows the highest per passenger benefits, which add up to $ 186 per passenger in the 'Tax Removal' scenario, and to $ 206 per passenger in the 'Tax Removal and Charges Reduction' scenario. Per passenger benefits are also relatively high for Guyana.

Figure 11.1 Total consumer benefits are highest in Argentina and Colombia



Source: SEO NetCost

Total consumer and wider economic benefits

The total consumer and wider economic benefits are estimated at $ 5.1 billion in the 'Tax Removal' scenario and $ 6.8 in the 'Tax Removal and Charges Reduction' scenario (Table 11.3). Consumer benefits 'ripple' through the rest of the economy, creating additional wider economic benefits in the form of agglomeration and productivity benefits. In addition, lower generalized travel costs stimulate the market, resulting in higher passenger numbers and net job creation.

Table 11.3 Total consumer and wider economic benefits for South America are estimated at $ 5.1 billion in the 'Tax Removal' scenario and $ 6.8 billion in the 'Tax Removal and Charges Reduction' scenario

Total benefits (mln USD)	Tax Removal	Tax Removal and Charges Reduction
Direct consumer benefits	4,379	5,706
Agglomeration/productivity	179	223
Employment effects	568	890
Total	**5,126**	**6,819**

Source: SEO NetCost

11.1.2 Consumer benefits up to 2035

For 2035, total consumer benefits in the 'Tax Removal' scenario are estimated at $ 9.9 billion and $ 12.9 billion in the 'Tax Removal and Charges Reduction' scenario (Table 11.4 and Table 11.5). Total discounted benefits over the period 2014-2035 add up to $ 90 billion and $ 119 billion in the 'Tax Removal' and 'Tax Removal and Charges Reduction' scenarios respectively (Table 11.7).

Until 2035, passenger traffic is expected to grow significantly in South America. The total number of departing passengers from South America – residing in one of the South American countries – is expected to increase to 202 million in 2035 in the 'Tax Removal' scenario. This growth also means that more consumers and businesses will benefit from lower travel costs if charges and/or taxes are reduced, in comparison to a 'do nothing' scenario ('Baseline').

Table 11.4 Consumer benefits accumulate to almost $ 10 billion in 2035 in the 'Tax Removal' scenario

	2020			2025			2035		
'Tax Removal' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in South America (mln)	24	89	**113**	30	111	**141**	43	160	**202**
Total benefits (mln USD)	1,542	4,105	**5,647**	1,872	4,981	**6,853**	2,710	7,181	**9,892**
Per passenger benefits	$65	$46	**$50**	$63	$45	**$49**	$64	$45	**$49**

Source: SEO NetCost

Table 11.5 Consumer benefits increase to $ 13 billion in 2035 in the 'Tax Removal and Charges Reduction' scenario

	2020			2025			2035		
'Tax Removal and Charges Reduction' scenario	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*	*Business*	*Leisure*	*Total*
Total passengers residing in South America (mln)	24	93	**117**	30	116	**146**	43	166	**209**
Total benefits (mln USD)	1,917	5,437	**7,354**	2,333	6,609	**8,942**	3,363	9,491	**12,854**
Per passenger benefits	$80	$59	**$63**	$78	$57	**$61**	$78	$57	**$61**

Source: SEO NetCost

Table 11.6 Agglomeration/productivity and employment benefits result in an additional 11 percent of benefits, on top of consumer benefits, in the 'Tax Removal' scenario

	'Tax Removal'			'Tax and Charges Removal'		
Impacts (USD million, undiscounted)	**2020**	**2025**	**2035**	**2020**	**2025**	**2035**
Consumer benefits	5,647	6,853	9,892	7,354	8,942	12,854
Agglomeration/productivity	231	281	407	288	350	504
Employment effects	604	632	678	944	985	1,053
Total	**6,482**	**7,766**	**10,977**	**8,586**	**10,277**	**14,411**

Source: SEO NetCost

Table 11.7 Cumulative, discounted benefits in the 'Tax Removal' scenario add up to $ 90 billion over the period 2014-2035

Impacts (USD billion, discounted)	**'Tax Removal'**	**'Tax Removal and Charges Reduction'**
	2014-2035	2014-2035
Consumer benefits	79.7	103.8
Agglomeration/productivity	3.3	4.1
Employment effects	7.1	11.1
Total	**90**	**119**

Source: SEO NetCost

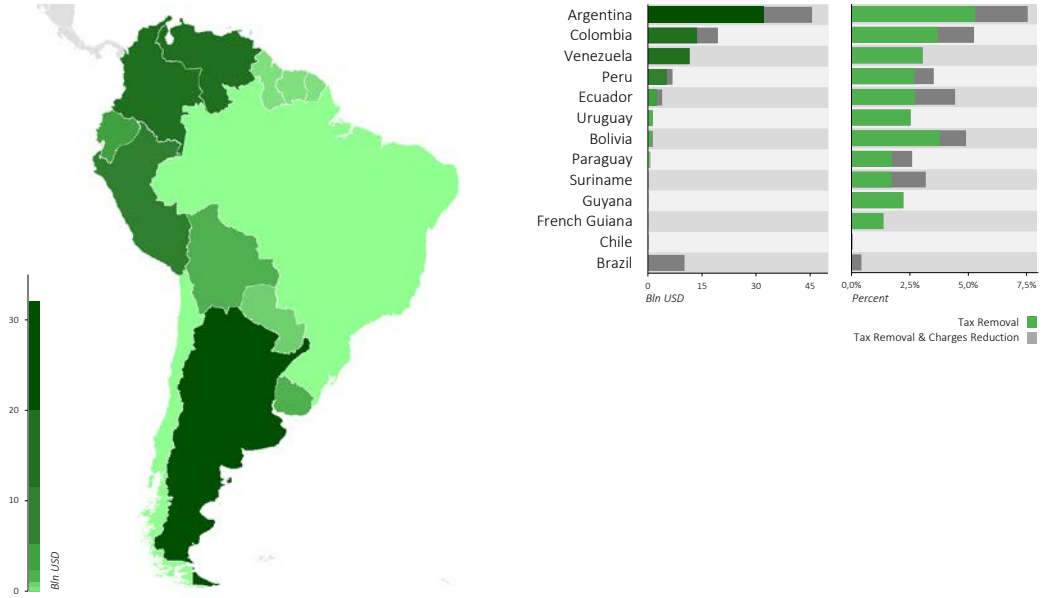
There are substantial differences in benefits between the individual countries in South America. The differences between the countries depend mainly on the future sizes of the aviation markets of the individual countries as well as their taxes and charges regimes. The differences between the various countries in 2035 are in line with those for the immediate consumer welfare benefits (section 11.1.1) and have been reported in Appendix H.

11.2 Macro-economic impacts

11.2.1 Impacts on GDP

Using the results from the panel data analysis (see Chapter 8), we have estimated the GDP and employment impacts for the different economies in South America. We estimate the total, immediate GDP increase in South America in the 'Tax Removal' scenario, using 2012 GDP figures, at $ 68 billion, in comparison to the 'Baseline' scenario. This represents a 1.5 percent increase in GDP. This number rises to $ 101 billion and 2.3 percent increase in the 'Tax Removal and Charges Reduction' scenario (Appendix I).

Figure 11.2 Relative GDP increase in the 'Tax Removal' scenario highest in Argentina, Bolivia and Colombia



Source: SEO

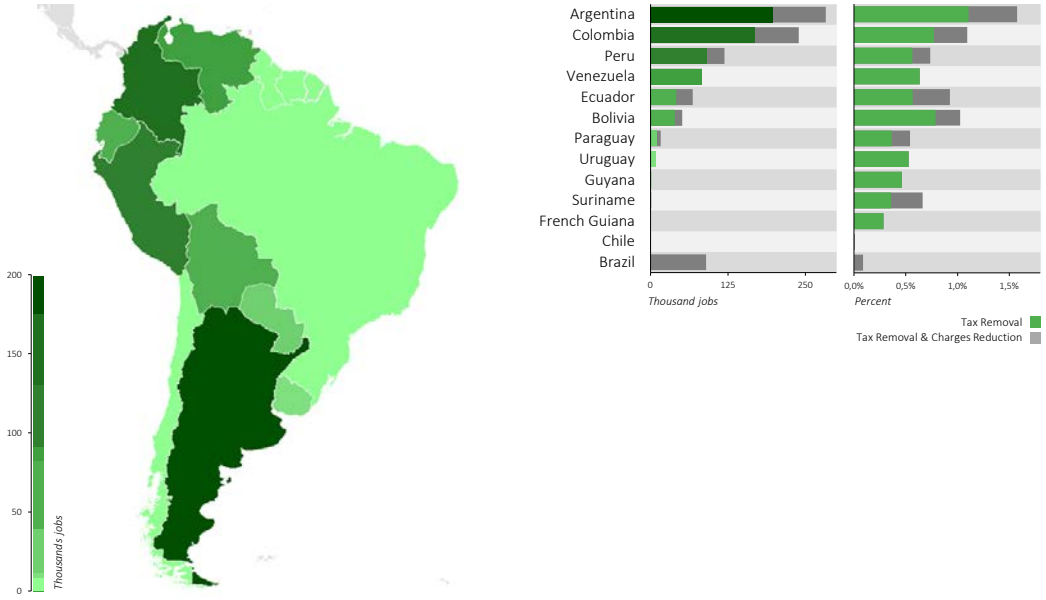
As Figure 11.2 shows, largest absolute GDP impacts are estimated for Argentina, Colombia and Venezuela in the 'Tax Removal' scenario, while in relative terms, also Bolivia, Ecuador, Uruguay and Guyana benefit substantially. In the 'Tax Removal and Charges Reduction' scenario, Argentina, Colombia and Venezuela gain most in terms of GDP. In relative terms, also Peru, Ecuador, Bolivia, Paraguay and Suriname may potentially benefit from strong relative GDP growth. Impacts in Chile and Brazil are very limited in the 'Tax Reduction' scenario. For Brazil, this is related to the absence of taxes. Therefore, only effects are observed when charges are reduced. Chile only has domestic taxes and very low passenger based charges, resulting in very limited impacts.

11.2.2 Impacts on employment

In terms of employment impacts, we estimate the potential, immediate job contribution of a removal of taxes in South America at 644 thousand jobs in the 'Tax Removal' scenario and 962 thousand jobs in the 'Tax Removal and Charges Reduction' scenario (Appendix I). As the South American economies have high structural unemployment, a large informal sector, relatively low labour productivity and a –on average- low penetration of aviation in the economy, the per passenger job effects are higher than would be the case in Europe or North America. Hence, aviation growth may provide a strong opportunity for job growth in the South American economies.

There are again substantial differences between the various economies. Differences are rather similar to those concerning the GDP impacts. We estimate the potential employment growth to be largest in absolute terms in Argentina, Colombia, Peru and Venezuela in both scenarios. When taxes are removed, in relative terms growth rates are also substantial in Bolivia, Ecuador, Uruguay and Guyana. In the 'Tax Removal and Charges Reduction' scenario, also Suriname shows high relative growth rates.

Figure 11.3 Argentina, Colombia, Peru and Venezuela show highest absolute employment growth in the 'Tax Removal' scenario



Source : SEO

11.2.3 Impacts on tourism

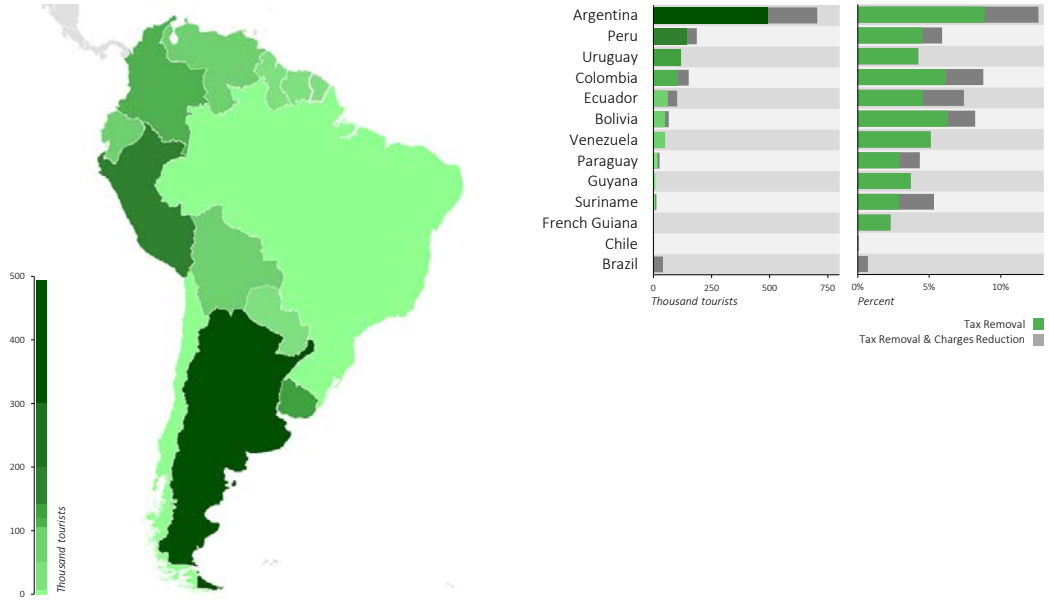
Next to GDP and employment, also tourism is expected to grow as a result of both the 'Tax Removal' and 'Tax Removal and Charges Reduction' scenarios. For the whole South American continent we estimate an increase of close to 1.1 million and 1.5 million additional yearly tourist visits in the first and second scenarios, respectively. Figure 11.4 shows the relative and absolute gains expected in each individual country.

When looking at the 'Tax Removal' scenario, the largest effect on tourism of all the countries in the region is expected to take place in Argentina, due to the sheer size of the country and the relatively high aviation taxes, both in absolute as well as relative terms. We estimate a positive impact on current tourism figures of 8.9 percent, resulting in an increase of almost 500 thousand tourists. Bolivia, Colombia and Venezuela follow, with expected impact rates of 6.3 percent, 6.2 percent and 5.1 percent, respectively. With the exception of Brazil and Chile, where no aviation taxes are levied, tourism numbers are expected to increase in all remaining countries at rates ranging from 4.5 and 2.3 percent as can be seen in figure 11.4.

Implementing the 'Tax Removal and Charges Reduction' scenario in our model leads to higher expected results in all countries except French Guiana, Guyana, Uruguay, Venezuela and Chile, where aviation charges are inexistent or very close to zero. In this scenario – as well as in the previous one – Argentina's tourism numbers are expected to grow the most within the region, increasing with 12.6 percent, or over 700 thousand additional tourists. This is an increment of 3.8 percent compared to the previous scenario. Further, next to Argentina, we estimate that the biggest effects of this scenario compared to the previous one occur in Ecuador, Colombia, Suriname and Bolivia, with the relative rate of impact jumping upwards to 7.4 percent, 8.8 percent, 5.3 percent

and 8.2 percent, respectively. Finally, tourism figures in Paraguay and Peru are expected to increase with 1.4 percent each compared to the 'Tax Removal' scenario (figure 11.4).

Figure 11.4 Relative increase in tourism highest in Argentina, Colombia, Bolivia and Venezuela in the 'Tax Removal' scenario



Source : SEO

12 Conclusions

Aviation plays an important role in today's globalized society. The connectivity by air it generates is a key element for the competitive position of countries in Latin America and the Caribbean, its regions and cities in an international context. A superior connectivity performance minimizes travel costs for passengers, businesses and shippers/ exporters. It generates agglomeration economies, stimulates productivity and tourism. Furthermore, airports and civil airspace users support many jobs in the economies of Latin America and the Caribbean.

The analysis presented in this report provides evidence on the substantial economic benefits that reduction of aviation taxes can bring to the economies of Latin America and the Caribbean. The study also shows that significant potential benefits of connectivity growth will be foregone for consumers and businesses if taxes remain at their current levels.

The total present value of benefits from the removal of aviation taxes in Latin America and the Caribbean was estimated at $ 122 billion up to 2035, compared to a 'do nothing' scenario. These include direct consumer benefits as well as wider economic benefits If also passenger-related charges are reduced, the present value will increase to $ 170 billion. The estimated benefits are driven by lower fares, increase in connectivity, shorter travel times, demand growth and wider economic benefits, including job growth and productivity benefits. The removal of aviation taxes can potentially deliver an additional GDP contribution of $ 87 billion. If charges are also reduced, this amount will increase to $ 135 billion.

In the Latin American and Caribbean economies, overall penetration of air travel into society is still relatively low compared to North America and Europe. In addition, structural unemployment is high, the economy is characterized by a large share of informal jobs and high transport costs tend to be an impediment to growth. Within this context, removal of aviation taxes and a reduction in charges can be a strong stimulus to economic growth and competitiveness in today's global society. On the other hand, if taxes remain in place as they are today, the substantial foregone economic benefits may limit the competitiveness of the Latin American and Caribbean economies, when compared to countries that see air transport as a catalyst for economic growth.

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Appendix A Exchange rates

Table A. 1 Average exchange rates in 2014

Country	Currency	Exchange rate (USD / x)
Argentina	ARS	0.1231
Bolivia	BOB	0.1478
Brazil	BRL	0.4264
French overseas departments	EUR	1.3271
Chile	CLP	0.0018
Colombia	COP	0.0005
Venezuela	VEF	0.1590
Venezuela	VEB	0.0002
Guatemala	GTQ	0.1316
Mexico	MXN	0.0751
Bahamas	BSD	1.0052
Barbados	BBD	0.5000
Cayman Islands	KYD	1.2216
Curacao	ANG	0.5618
Haiti	HTG	0.0229
Jamaica	JMD	0.0091
Trinidad and Tobago	TTD	0.1592
Grenada, Montserrat, Saint Lucia	XCD	0.3720

Source: www.oanda.com

Appendix B Tax and charges burden per country

Table B. 1 Taxes, charges and average airfares per country

	Domestic					International				
	Total taxes (fixed fees)	Total taxes (% of ticket price)	Total Charges	Total charges (% of ticket price)	One way fare (USD)	Total taxes (fixed fees)	Total taxes (% of ticket price)	Total Charges	Total charges (% of ticket price)	One way fare (USD)
Anguilla	$ -	-	$ -	-		$15.00	-	$5.00	-	$89
Antigua and Barbuda	$ -	10%	$ -	-		$ -	10%	$37.50	-	$211
Argentina	$ -	15%	$4.49	-	$120	$10.00	40%	$50.92	-	$307
Aruba	$ -	-	$ -	-		$10.00	-	$37.50	-	$173
Bahamas	$ -	8%	$12.27	-	$86	$ -	8%	$45.08	-	$141
Barbados	$ -	18%	$ -	-		$ -	18%	$32.20	-	$234
Belize	$ -	-	$ -	-	$84	$36.75	-	$17.49	-	$195
Bermuda	$ -	-	$ -	-		$35.00	-	$7.75	-	$187
Bolivia	$ -	19%	$2.03	-	$92	$41.53	15%	$24.96	-	$250
Bonaire, Saint Eustatius and Saba	$ -	-	$9.00	-	$94	$ -	-	$35.00	-	$168
Brazil	$ -	-	$9.85	-	$103	$ -	-	$34.98	-	$369
British Virgin Islands	$ -	-	$ -	-	$91	$ -	-	$17.00	-	$84
Cayman Islands	$ -	-	$ -	-	$97	$53.38	-	$11.25	-	$160
Chile	$ -	19%	$11.67	-	$113	$ -	-	$11.93	-	$287
Colombia	$ -	16%	$6.54	-	$96	$51.26	16%	$40.86	-	$220
Costa Rica	$ -	-	$ -	-	$79	$44.00	5%	$8.30	-	$212
Cuba	$ -	-	$ -	-	$98	$23.39	-	$ -	-	$260
Curacao	$ -	-	$10.11	-		$ -	-	$29.83	-	$196
Dominica	$ -	-	$ -	-		$ -	8%	$ -	-	$92
Dominican Republic	$ -	18%	$ -	-		$20.00	18%	$31.30	-	$219
Ecuador	$10.48	12%	$2.37	-	$87	$40.19	12%	$49.58	-	$263
El Salvador	$ -	-	$ -	-		$15.00	13%	$22.13	-	$191
French Guiana	$24.28	-	$5.78	-		$70.59	-	$5.78	-	$315
Grenada	$ -	-	$ -	-		$13.44	-	$33.54	-	$188
Guadeloupe	$6.61	-	$5.78	-		$19.31	-	$8.09	-	$240
Guatemala	$ -	12%	$2.63	-	$87	$30.00	12%	$2.63	-	$189
Guyana	$ -	15%	$5.00	-		$ -	15%	$5.00	-	$201
Haiti	$ -	10%	$5.50	-	$90	$57.82	10%	$9.58	-	$151
Honduras	$ -	15%	$ -	-	$83	$32.22	15%	$7.50	-	$169
Jamaica	$0.27	-	$12.20	-	$82	$61.89	-	$25.40	-	$189
Martinique	$19.08	-	$5.78	-		$25.06	-	$37.71	-	$260
Mexico	$ -	10%	$20.62	-	$103	$22.99	4%	$38.02	-	$216
Montserrat	$ -	-	$ -	-		$ -	-	$14.88	-	$95
Nicaragua	$ -	15%	$ -	-		$ -	15%	$42.00	-	$186

Panama	$ -	7%	$ -	-	$116	$40.00	7%	$1.25	-	$192
Paraguay	$5.80	-	$4.00	-	$104	$41.80	3%	$25.00	-	$211
Peru	$ -	18%	$7.95	-	$96	$15.00	18%	$29.43	-	$282
Puerto Rico	$ -	-	$6.90	-	$80	$ -	-	$7.34	-	$159
Saint Kitts and Nevis	$ -	10%	$ -	-	$80	$15.00	10%	$32.00	-	$145
Saint Lucia	$ -	-	$ -	-		$ -	8%	$35.53	-	$207
Saint Vincent and Grenadines	$ -	5%	$ -	-		$ -	5%	$19.00	-	$101
St. Barthélemy	$22.00	-	$15.91	-		$ -	-	$51.91	-	$166
St Maarten	$19.08	-	$9.99	-		$25.15	-	$37.86	-	$91
Suriname	$ -	8%	$ -	-		$25.00	8%	$41.00	-	$342
Trinidad and Tobago	$ -	15%	$ -	-	$96	$ -	15%	$41.85	-	$188
Turks and Caicos Islands	$ -	-	$ -	-	$86	$29.00	-	$41.00	-	$166
Uruguay	$2.00	8%	$ -	-	$107	$40.50	8%	$ -	-	$249
US Virgin Islands	$ -	-	$4.50	-	$87	$ -	-	$4.50	-	$171
Venezuela	$13.69	8%	$0.00	1%	$88	$134.73	6%	$0.00	1%	$214

Source: IATA TTBS, SEO NetCost

Appendix C Regional classification

Table C. 1 Regional classification

Country	Country group (Caribbean)	Sub-region
Anguilla, Leeward Islands	UK BOT & Commonwealth	Caribbean
Antigua and Barbuda, Leeward Islands	UK BOT & Commonwealth	Caribbean
Argentina		South America
Aruba	Dutch Caribbean	Caribbean
Bahamas	Bahamas	Caribbean
Barbados	UK BOT & Commonwealth	Caribbean
Belize		Central America
Bermuda	UK BOT & Commonwealth	Caribbean
Bolivia		South America
Bonaire, Saint Eustatius and Saba	Dutch Caribbean	Caribbean
Brazil		South America
Cayman Islands	UK BOT & Commonwealth	Caribbean
Chile		South America
Colombia		South America
Costa Rica		Central America
Cuba	Cuba	Caribbean
Curacao	Dutch Caribbean	Caribbean
Dominica	UK BOT & Commonwealth	Caribbean
Dominican Republic	Dominican Republic	Caribbean
Ecuador		South America
El Salvador		Central America
French Guiana		South America
Grenada, Windward Islands	UK BOT & Commonwealth	Caribbean
Guadeloupe	Haiti & French West Indies	Caribbean
Guatemala		Central America
Guyana		South America
Haiti	Haiti & French West Indies	Caribbean
Honduras		Central America
Jamaica	Jamaica	Caribbean
Martinique	Haiti & French West Indies	Caribbean
Mexico		Central America
Montserrat, Leeward Islands	UK BOT & Commonwealth	Caribbean
Nicaragua		Central America
Panama		Central America
Paraguay		South America
Peru		South America
Puerto Rico	Puerto Rico & US Virgin Islands	Caribbean
Puerto Rico & US Virgin Islands		Central America
Saint Barthelemy	Haiti & French West Indies	Caribbean
Saint Kitts and Nevis, Leeward Islands	UK BOT & Commonwealth	Caribbean
Saint Lucia	UK BOT & Commonwealth	Caribbean

Saint Martin	Haiti & French West Indies	Caribbean
St Maarten (Dutch Part)	Dutch Caribbean	Caribbean
St Vincent and the Grenadines	UK BOT & Commonwealth	Caribbean
Suriname		South America
Trinidad and Tobago	Trinidad and Tobago	Caribbean
Turks and Caicos Islands	UK BOT & Commonwealth	Caribbean
Uruguay		South America
Venezuela		South America
Virgin Islands, British	UK BOT & Commonwealth	Caribbean
Virgin Islands, US	Puerto Rico & US Virgin Islands	Caribbean

Appendix D NetCost model

The SEO NetCost model has been used to calculate consumer benefits. The model uses OAG schedule data for all direct and indirect alternatives to determine generalized costs and market shares for individual markets. The NetCost model was first presented in Heemskerk and Veldhuis (2006a, 2006b) and further developed by Veldhuis and Lieshout (2009)[34]. NetCost has been used to compute generalized travel costs in the three different scenarios. NetCost allows to compute the average decrease in travel costs per passenger and welfare impacts.

Welfare effects are determined using a four-step approach:

1. Construct airline networks in the 'Baseline' and in both scenarios for 2025 and 2035, based on OAG schedule data and passenger growth forecasts;
2. Determine generalized travel costs and consumer utility in each scenario using the NetCost model;
3. Using price elasticities for business and leisure, estimate the change in passengers and flight frequency between the baseline and reference scenario following a decrease in generalized travel costs;
4. An increase in flight frequency in the previous step leads again to a decrease in generalized travel costs. Step 3 is re-iterated to determine the additional demand stimulation following the increase in flight frequency.

Construction of future airline networks

Using the passenger forecasts as described in Chapter 5, the 2014 airline network has been extrapolated to the horizon years. For each airport, we forecasted a network for 2025 and 2035. The 2014 networks have been extrapolated by increasing the seat capacity offered in 2014 in line with annual passenger growth rates in the respective scenarios, taking into account aircraft size growth figures for each scenario.

The NetCost model also requires a 'beyond-network' for the horizon years to incorporate indirect travel alternatives to final destinations. This 'beyond-network' consists of all destinations that can be reached from Latin America and the Caribbean with a connection at an intermediate hub airport (transfer connections). Direct and indirect travel alternatives are used to determine the competition level in each individual origin-destination market, which is an input variable for the air fare model. For the extrapolation of the beyond network, growth figures from airports outside the region are also required. For these airports we apply growth figures as published by Boeing (2015).

Calculating generalized travel costs and consumer value

Generalized travel costs comprise of a fare, time and frequency component (
Figure D. 1). Time costs are calculated using Values of Travel Time for each Latin American country for business and leisure passengers (see Appendix A), multiplied by the travel time of the respective route alternative. For indirect connections an average transfer time of 2.5 hours is assumed.

[34] See also Lieshout & Matsumoto (2012)

The frequency component denotes costs resulting from schedule delay. Schedule delay is the difference between the departure time preferred by the passenger and the actual departure time. Schedule delay decreases when the flight frequency increases. The costs associated with schedule delay equal the schedule delay (in hours) time multiplied by the Value of Waiting Time for the next flight. By calibration of the model we found that market shares were represented best by using a Value of Waiting Time of $0 for leisure passengers and of $5 for business passengers.

The NetCost fare model determines the airfare for an individual route alternative based on travel time, competition level, carrier type and connection type. One-way air fares in US Dollars are estimated using Ordinary Least Squares (OLS) on passenger booking data.

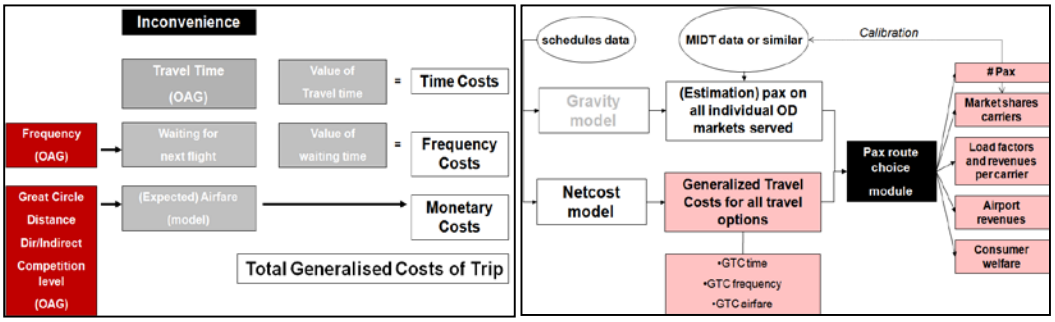
After the generalized travel costs (GC) are calculated, a utility function is used to determine the Consumer Value (CV), having as base the frequency (*f*). A cost sensitivity parameter α is included. After calibrating the model, we find that $\alpha = 0.01$ for business passengers and $\alpha = 0.015$ for leisure passengers are the most appropriate values. The consumer value for route alternative *i* (CV_i) is given by:

$$CV_i = f \cdot e^{-\alpha \cdot GC_i}$$

Market shares of route alternatives are estimated using these consumer values. The market share of a route alternative *i* is given by:

$$MS_i = \frac{CV_i}{\sum_j CV_j}$$

Figure D. 1 The NetCost model is used to determine Generalized Travel Costs for each trip



Source: SEO

Measuring consumer welfare benefits

Consumer benefits in the two scenarios in comparison to the baseline have been estimated at the origin-destination market level. In each OD-market, the average price decrease following a tax or charge reduction is known, both for passengers traveling for business and for leisure. Using a price elasticity of -0.5 for business passengers and -1.5 for leisure passengers, we can compute the average increase in passengers in the two scenario with respect to the baseline in the respective OD-market.

The change in business and leisure passengers following a tax reduction is given by:

$$\Delta pax_{bus} = \left(\frac{GC_{bus}^{SCEN}}{GC_{bus}^{BASE}}\right)^{-0.5}$$
$$\Delta pax_{leis} = \left(\frac{GC_{leis}^{SCEN}}{GC_{leis}^{BASE}}\right)^{-1.5}$$

Where GC_m^S denotes the generalized travel costs per OD market in scenario S for a passenger with travel motive m. An increase in passengers following a tax or charge decrease also results in an increase in flight frequency, which in turn leads to lower generalized costs. Therefore, this step is re-iterated, to include the second-order effects of an increase in the number of flights.

The difference in generalized travel costs between the two scenarios gives the welfare gain per passenger in each market. We compute the total consumer welfare benefit for each OD market by applying the so-called 'rule of half': the welfare gain per passenger is multiplied by the number of OD-passengers in the respective market in the baseline scenario. The number of new passengers – which do not travel in the baseline scenario but do travel in the less constrained scenario – is multiplied by half of the welfare gain per passenger.

Appendix E Values of Time

We estimate the values of time for leisure and business passengers following the guidelines in the 'Handbook on estimation of external costs in the transport sector' (CE Delft, 2008), which was commissioned by the European Commission:

$$Value\ of\ Time_{\ country,motive} = Value\ of\ Time_{\ EU,motive} \times \left(\frac{GDP\ per\ capita\ in\ PPP_{country}}{GDP\ per\ capita\ in\ PPP_{\ EU}}\right)^{1.0}$$

This formula takes the average $Value\ of\ Time_{\ EU,motive}$ in all EU Member States for both travel motives and corrects it for the relative size of a country's GDP per capita in purchasing-power-parities (PPPs) ($GDP\ per\ capita\ in\ PPP_{country}$) compared to the EU average ($GDP\ per\ capita\ in\ PPP_{EU}$). The average value of time in the EU is given by HEATCO (2004) for both business and leisure passengers. These valuations were also converted to current levels using Eurostat consumer price indices. The GDP per capita values (in PPPs) for individual countries and for the EU as a whole are given by IMF's World Economic Outlook Database.

Appendix F Discounting

Comparing costs and benefits occurring at different points in time is not simply a matter of adding or subtracting. It is generally believed that the further a benefit or cost is pushed into the future, the less it is worth today. This consideration needs to be incorporated into calculations of net benefits. The process of reducing the value of benefits or costs occurring in the future is called discounting. This is generally done by multiplying costs or benefits by a fractional number depending on how far in the future they occur. Discounted values from each year of a project's life are added up to calculate the project's net present value.

Costs or benefits occurring further in the future are discounted more heavily while those occurring closer to the present are discounted less heavily. Most countries (and the EU) have a proscribed discount rate, in order to prevent comparisons between policy options being obscured by the impact of different discount rates.

The discount rate is usually based on a rate of interest. Over the last decades discount rates used in SCBA have generally declined. The discount rate in the UK was reduced from 6 to 3.5 percent in 2003. Germany reduced its social discount rate from 4 to 3 percent in 2004 and France reduced its rate from 8 to 4 percent in 2005. This reflects falling interest rates, as most countries use the rate at which they borrow money as the basis for calculating discount rates (Koopmans & Rietveld 2013). The European Commission and Eurocontrol (2013c) recommend using a social discount rate of 4 percent.

Many environmental effects, especially climate change impacts, occur in the very long run. Over such long periods of time, much is uncertain about the impacts, but also about the appropriate discount rate (Koopmans & Rietveld 2013). Weitzman (2009) indicates that long-term climate risks are very hard to assess, but they are potentially so large that they might have a stronger impact than discounting using standard discount rates. Weitzman (1998) also shows that in case of uncertainty about the discount rate, the lowest rate is the most appropriate.

Some countries apply discount rates that decrease over time, which corresponds to incorporating increased risk. In the United Kingdom the rate falls steady from 3.5 percent in the first 30 years to 1 percent for effects that occur more than 300 years into the future (HM Treasury 2011). According to the EU, "such a reducing rate better reflects individuals' perceptions, uncertainties about the economy in the future and the concerns that constant-rate discounting shifts unfair burdens of social cost onto future generations". The US Environmental Agency recommends that for intergenerational discounting, a rate of 2–3 percent is used (Zhuang et al. 2007). CE Delft (2011) uses a 3 percent discount rate for CO2-emissions.

We apply a discount rate of 4.4 percent. This discount rate is derived from Lopez (2008), which estimates the social discount rates for nine Latin America countries in four scenarios. The 4.4 percent discount rate follows from the average of the two intermediate scenarios.

Appendix G Movements and passenger forecast per country

Total departing flights (thousands)	2014			2020			2025			2035		
	baseline	Tax Removal	Tax Removal and Charges Reduction	baseline	Tax Removal	Tax Removal and Charges Reduction	baseline	Tax Removal	Tax Removal and Charges Reduction	baseline	Tax Removal	Tax Removal and Charges Reduction
Argentina	154	173	188	158	178	194	160	181	197	178	202	221
Bahamas	69	70	73	94	96	99	111	113	117	140	143	148
Belize	210	210	210	346	346	346	490	490	490	662	662	663
Bolivia	82	87	99	112	119	136	146	155	177	254	270	309
Brazil	1,174	1,174	1,174	1,402	1,402	1,402	1,651	1,651	1,651	2,033	2,033	2,033
Chile	126	134	143	166	176	188	188	199	213	221	234	250
Colombia	252	271	300	354	380	420	444	476	526	576	617	683
Costa Rica	70	72	74	131	134	137	178	180	184	249	253	257
Cuba	22	22	22	23	23	24	24	25	25	28	29	29
Dominican Republic	43	48	53	53	60	66	59	66	72	74	82	90
Dutch Caribbean	67	69	72	70	72	75	70	72	75	72	74	77
Ecuador	70	75	85	93	101	114	117	126	142	155	167	189
El Salvador	23	25	27	31	34	36	36	39	42	46	51	54
French Guiana	2	2	2	2	3	3	3	3	3	3	3	3
Guatemala	17	19	21	24	27	29	28	32	35	39	44	48
Guyana	5	6	6	6	6	6	6	7	7	8	9	9
Haiti & French West Indies	57	59	63	76	80	85	80	84	89	90	94	100
Honduras	30	35	37	56	64	68	80	91	97	135	153	163
Jamaica	22	23	25	27	29	32	30	32	35	36	38	41
Mexico	564	588	612	761	795	827	880	918	956	1,201	1,255	1,306

Nicaragua	7	8	8	11	12	13	13	14	15	19	21	22
Panama	72	77	82	100	107	113	120	128	135	165	176	186
Paraguay	7	7	8	10	10	11	13	13	14	18	19	20
Peru	126	135	150	167	178	198	197	211	234	282	300	334
Puerto Rico & US Virgin Islands	105	105	105	128	128	128	137	137	137	161	161	161
Suriname	2	2	2	3	3	3	3	3	3	3	3	4
Trinidad and Tobago	34	36	39	43	45	48	44	46	49	46	48	52
UK BOT & Commonwealth	118	122	126	143	147	152	153	157	163	177	182	188
Uruguay	10	11	12	12	13	14	13	14	16	17	18	20
Venezuela	95	102	112	105	114	124	118	128	140	135	145	159
Caribbean	537	555	578	657	679	708	709	732	763	823	851	887
Central America	993	1,034	1,071	1,460	1,518	1,569	1,824	1,893	1,953	2,517	2,614	2,698
South America	2,104	2,178	2,280	2,589	2,682	2,813	3,059	3,166	3,324	3,883	4,021	4,234
Total	**3,635**	**3,767**	**3,930**	**4,707**	**4,879**	**5,091**	**5,591**	**5,791**	**6,041**	**7,222**	**7,486**	**7,819**

2014 (immediate impact analysis) Total departing pax (thousands)	baseline			Tax Removal				Tax Removal and Charges Reduction			
	Pax Business	Pax Leisure	Pax Total	Pax Business	Pax Leisure	Pax Total	% change (w.r.t. baseline)	Pax Business	Pax Leisure	Pax Total	% change (w.r.t. baseline)
Argentina	2,974	10,392	13,366	3,207	13,396	16,604	24%	3,234	14,023	17,257	29%
Bahamas	412	1,386	1,798	422	1,501	1,923	7%	433	1,699	2,132	19%
Belize	201	752	952	202	767	968	2%	202	772	974	2%
Bolivia	950	2,637	3,587	1,020	3,374	4,394	22%	1,022	3,417	4,439	24%
Brazil	18,055	63,985	82,040	18,055	63,985	82,040	0%	18,211	66,776	84,986	4%
Chile	2,845	8,292	11,137	2,977	9,713	12,690	14%	3,001	10,145	13,146	18%
Colombia	4,463	16,100	20,563	4,743	19,814	24,557	19%	4,787	20,757	25,544	24%
Costa Rica	532	1,660	2,192	550	1,914	2,464	12%	551	1,923	2,474	13%
Cuba	585	2,087	2,672	590	2,174	2,763	3%	590	2,173	2,763	3%
Dominican Republic	1,032	3,510	4,542	1,101	4,412	5,514	21%	1,115	4,685	5,800	28%
Dutch Caribbean	624	2,126	2,750	629	2,209	2,838	3%	640	2,435	3,075	12%
Ecuador	1,218	4,291	5,508	1,294	5,432	6,726	22%	1,302	5,605	6,907	25%
El Salvador	220	690	910	233	835	1,068	17%	235	873	1,108	22%
French Guiana	56	154	210	57	171	228	9%	57	171	228	9%
Guatemala	253	802	1,055	269	1,006	1,275	21%	269	1,006	1,275	21%
Guyana	53	157	211	57	191	247	17%	57	191	247	17%
Haiti & French West Indies	514	1,834	2,348	531	2,133	2,665	13%	538	2,277	2,815	20%
Honduras	184	623	807	198	810	1,008	25%	198	813	1,011	25%
Jamaica	476	1,623	2,100	495	1,938	2,433	16%	500	2,045	2,546	21%
Mexico	8,636	30,141	38,777	8,896	33,484	42,380	9%	9,071	36,896	45,967	19%
Nicaragua	114	348	462	120	410	531	15%	123	462	586	27%
Panama	632	1,836	2,468	660	2,166	2,826	14%	659	2,166	2,825	14%

Paraguay	108	320	428	111	367	478	12%	112	387	499	17%
Peru	2,330	7,962	10,292	2,478	9,818	12,295	19%	2,502	10,316	12,818	25%
Puerto Rico & US Virgin Islands	1,094	3,837	4,931	1,094	3,837	4,931	0%	1,094	3,842	4,936	0%
Suriname	53	165	218	55	190	245	12%	56	207	263	20%
Trinidad and Tobago	408	1,345	1,753	427	1,572	1,999	14%	431	1,639	2,070	18%
UK BOT & Commonwealth	829	2,506	3,335	852	2,782	3,634	9%	861	2,943	3,804	14%
Uruguay	211	615	827	221	748	970	17%	221	748	970	17%
Venezuela	1,895	6,753	8,647	1,991	8,282	10,273	19%	1,991	8,283	10,274	19%
Total	51,958	178,929	**230,887**	53,534	199,431	**252,965**	9.6%	54,065	209,675	**263,739**	14.2%
residents	23,556	81,164	**104,720**	24,281	90,554	**114,835**	9.7%	24,519	95,166	**119,685**	14.3%
non-residents	28,403	97,764	**126,167**	29,253	108,877	**138,130**	9.5%	29,546	114,509	**144,054**	14.2%
Caribbean	5,976	20,253	**26,229**	6,142	22,558	**28,700**	9.4%	6,202	23,739	**29,942**	14.2%
Central America	10,772	36,852	**47,624**	11,127	41,392	**52,519**	10.3%	11,308	44,911	**56,219**	18.0%
South America	35,211	121,824	**157,035**	36,265	135,481	**171,746**	9.4%	36,555	141,024	**177,578**	13.1%

Total number of departing pax (thousands)		2020			2025			2035		
		Baseline	Tax Removal	Tax and Charges Removal	Baseline	Tax Removal	Tax and Charges Removal	Baseline	Tax Removal	Tax and Charges Removal
Argentina	**South America**	13,617	17,075	17,823	14,882	18,686	19,517	20,646	25,967	27,142
Bahamas	**Caribbean**	2,537	2,714	3,007	3,037	3,249	3,597	4,193	4,487	4,966
Belize	**Central America**	1,610	1,632	1,640	2,323	2,349	2,358	3,491	3,526	3,538
Bolivia	**South America**	5,305	6,504	6,577	7,326	8,979	9,077	14,294	17,509	17,678
Brazil	**South America**	103,785	103,785	107,518	129,526	129,526	134,189	179,708	179,708	186,182
Chile	**South America**	15,731	17,903	18,543	18,926	21,557	22,332	25,220	28,642	29,655
Colombia	**South America**	30,936	36,914	38,373	41,116	49,023	50,932	60,236	71,802	74,583
Costa Rica	**Central America**	3,371	3,768	3,782	4,322	4,817	4,834	6,534	7,274	7,300
Cuba	**Caribbean**	3,085	3,185	3,185	3,469	3,579	3,579	4,539	4,682	4,682
Dominican Republic	**Caribbean**	6,048	7,342	7,723	7,084	8,599	9,045	9,996	12,132	12,760
Dutch Caribbean	**Caribbean**	3,070	3,168	3,433	3,285	3,391	3,674	3,798	3,919	4,247
Ecuador	**South America**	7,882	9,628	9,880	10,420	12,737	13,056	15,569	19,038	19,504
El Salvador	**Central America**	1,326	1,556	1,614	1,636	1,920	1,992	2,367	2,778	2,883
French Guiana	**South America**	303	330	330	340	369	369	431	468	468
Guatemala	**Central America**	1,596	1,929	1,930	2,032	2,457	2,457	3,160	3,820	3,821
Guyana	**South America**	238	279	279	275	322	322	400	469	469
Haiti & French West Indies	**Caribbean**	3,406	3,864	4,081	3,816	4,329	4,572	4,835	5,486	5,795
Honduras	**Central America**	1,429	1,777	1,781	2,010	2,491	2,496	3,606	4,455	4,464
Jamaica	**Caribbean**	2,808	3,251	3,403	3,262	3,774	3,951	4,319	4,993	5,228
Mexico	**Central America**	55,580	60,788	66,008	67,792	74,173	80,589	103,409	113,214	123,129
Nicaragua	**Central America**	748	858	947	950	1,091	1,203	1,537	1,765	1,947
Panama	**Central America**	3,521	4,018	4,017	4,468	5,096	5,095	6,907	7,875	7,874
Paraguay	**South America**	666	743	776	893	995	1,039	1,450	1,615	1,686
Peru	**South America**	14,562	17,398	18,138	18,319	21,887	22,819	29,435	35,172	36,670

Puerto Rico & US Virgin Islands	**Caribbean**	6,419	6,419	6,426	7,327	7,327	7,335	9,747	9,747	9,757
Suriname	**South America**	270	304	325	337	379	406	421	473	506
Trinidad and Tobago	**Caribbean**	2,346	2,675	2,774	2,554	2,910	3,022	3,004	3,421	3,557
UK BOT & Commonwealth	**Caribbean**	4,340	4,730	4,951	4,946	5,392	5,645	6,549	7,142	7,479
Uruguay	**South America**	1,079	1,265	1,265	1,260	1,478	1,478	1,799	2,110	2,110
Venezuela	**South America**	10,360	12,308	12,310	12,387	14,716	14,718	15,912	18,904	18,906
Caribbean		34,059	37,348	38,984	38,781	42,549	44,419	50,979	56,010	58,472
Central America		69,181	76,326	81,719	85,533	94,392	101,025	131,012	144,708	154,957
South America		204,733	224,434	232,137	256,007	280,656	290,255	365,520	401,876	415,559
Total		307,974	338,109	352,840	380,321	417,597	435,699	547,512	602,594	628,988

Appendix H Consumer benefits per country

	2014				2020				2025				2035			
	Total consumer benefit (mln USD)		Benefit per passenger (USD)		Total consumer benefit (mln USD)		Benefit per passenger (USD)		Total consumer benefit (mln USD)		Benefit per passenger (USD)		Total consumer benefit (mln USD)		Benefit per passenger (USD)	
Scenario	**TR**	**TRCR**	**TR**	**TRCR**	**TR**	**TRCR**	**TR**	**TRCR**	**TR**	**TRCR**	**TR**	**TRCR**	**TR**	**TRCR**	**TR**	**TRCR**
Argentina	1,575	1,820	186	206	1,760	2,043	201	224	1,949	2,264	204	226	2,747	3,193	206	229
Bahamas	12	28	27	58	17	40	27	57	21	49	26	56	29	69	26	55
Belize	2	3	5	6	3	4	4	5	3	4	3	4	4	6	3	4
Bolivia	154	166	69	74	234	254	71	76	320	346	70	75	603	649	68	73
Brazil	6	579	0	14	6	704	0	13	6	864	0	13	8	1,187	0	13
Chile	344	436	54	66	482	610	54	65	584	739	54	66	760	963	53	65
Colombia	998	1,244	77	92	1,455	1,809	75	90	1,878	2,331	73	87	2,723	3,379	73	86
Costa Rica	44	45	71	74	63	66	65	67	79	82	62	64	118	122	61	62
Cuba	10	10	17	18	11	11	16	16	12	12	15	15	16	16	15	15
Dominican Republic	92	115	132	155	123	152	132	155	144	179	132	155	203	252	132	155
Dutch Caribbean	20	72	15	51	22	80	15	51	23	86	15	51	27	99	15	51
Ecuador	238	290	74	88	338	410	73	87	442	532	72	85	656	787	72	84
El Salvador	46	57	99	117	67	82	99	117	83	102	99	117	120	147	99	117
French Guiana	9	9	79	79	13	13	79	79	15	15	79	79	18	18	79	79
Guatemala	69	69	106	106	105	105	106	106	133	134	106	106	207	207	106	106
Guyana	6	6	133	134	7	7	133	134	8	8	133	134	11	12	133	134
Haiti & French West Indies	80	110	55	71	115	158	54	71	129	177	54	71	164	225	54	71
Honduras	56	56	113	114	94	95	108	109	128	130	105	106	224	226	103	103
Jamaica	21	28	70	89	28	37	69	88	32	43	67	87	42	57	66	86
Mexico	602	1,168	39	69	890	1,732	39	69	1,102	2,149	39	69	1,726	3,373	38	68

Nicaragua	12	19	88	129	19	31	88	129	24	39	88	129	39	63	88	129
Panama	117	117	94	94	161	161	90	90	204	204	90	90	314	314	89	89
Paraguay	16	22	67	89	24	33	66	88	32	44	66	87	51	71	65	86
Peru	423	520	73	86	594	730	72	85	744	915	72	85	1,179	1,450	71	83
Puerto Rico & US Virgin Islands	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Suriname	7	11	90	129	9	14	90	129	11	17	90	129	14	21	90	129
Trinidad and Tobago	67	90	66	85	92	124	67	87	101	137	68	89	121	165	69	91
UK BOT & Commonwealth	124	172	63	83	162	224	63	83	185	256	63	83	247	341	63	84
Uruguay	40	40	105	105	52	52	105	105	61	61	105	105	86	87	105	105
Venezuela	562	563	103	104	673	675	103	104	805	807	103	104	1,034	1,037	103	104
Caribbean	426	624	48	67	570	827	49	68	648	939	49	68	850	1,225	50	69
Central America	947	1,535	49	73	1,402	2,276	48	72	1,757	2,844	48	72	2,752	4,459	48	72
South America	4,379	5,706	51	64	5,647	7,354	50	63	6,853	8,942	49	61	9,892	12,854	49	61
Total	**5,752**	**7,864**	**50**	**66**	**7,619**	**10,457**	**50**	**65**	**9,258**	**12,725**	**48**	**64**	**13,493**	**18,537**	**49**	**64**

Note: TR: ‘Tax Removal’ ; TRCR: ‘Tax Removal and Charges Reduction’.

Appendix I Macro-economic contribution per country

			Tax Removal		Tax Removal and Charges Reduction			Tax Removal		Tax Removal and Charges Reduction	
		GDP total (bln USD; 2012)	% increase	absolute increase (bln USD)	% increase	absolute increase (bln USD)	Employment total (mln; 2012)	% increase	absolute increase (thousands)	% increase	absolute increase (thousands)
Argentina	South America	604	5.3%	32.0	7.5%	45.6	17.94	1.1%	198	1.6%	283
Bahamas	Caribbean	8	0.8%	0.1	2.8%	0.2	0.19	0.2%	0	0.6%	1
Belize	Central America	2	1.1%	0.0	1.6%	0.0	0.14	0.2%	0	0.3%	0
Bolivia	South America	27	3.8%	1.0	4.9%	1.3	5.00	0.8%	39	1.0%	51
Brazil	South America	2,410	0.0%	0.0	0.4%	10.1	102.44	0.0%	0	0.1%	90
Chile	South America	265	0.0%	0.0	0.0%	0.1	8.19	0.0%	0	0.0%	1
Colombia	South America	370	3.7%	13.7	5.2%	19.4	21.84	0.8%	168	1.1%	239
Costa Rica	Central America	45	2.0%	0.9	2.0%	0.9	2.13	0.4%	9	0.4%	9
Cuba	Caribbean	73	0.4%	0.3	0.4%	0.3	5.21	0.1%	5	0.1%	5
Dominican Republic	Caribbean	61	3.0%	1.8	4.1%	2.5	4.00	0.6%	25	0.9%	34
Dutch Caribbean	Caribbean										
Ecuador	South America	88	2.7%	2.4	4.4%	3.9	7.37	0.6%	42	0.9%	68
El Salvador	Central America	24	2.3%	0.6	3.0%	0.7	2.58	0.5%	12	0.6%	16
French Guiana	South America										
Guatemala	Central America	50	3.0%	1.5	3.0%	1.5	6.64	0.6%	41	0.6%	41
Guyana	South America	3	2.2%	0.1	2.2%	0.1	0.29	0.5%	1	0.5%	1
Haiti & French West Indies	Caribbean	8	1.4%	0.1	3.7%	0.3	4.28	0.3%	13	0.8%	33
Honduras	Central America	19	3.7%	0.7	3.8%	0.7	3.24	0.8%	25	0.8%	26
Jamaica	Caribbean	15	2.3%	0.3	3.1%	0.5	1.14	0.5%	5	0.6%	7
Mexico	Central America	1,180	1.0%	11.9	2.0%	24.1	52.86	0.2%	111	0.4%	226

Nicaragua	Central America	11	1.9%	0.2	3.6%	0.4	2.52	0.4%	10	0.8%	19
Panama	Central America	38	2.0%	0.8	2.0%	0.8	1.76	0.4%	7	0.4%	7
Paraguay	South America	25	1.7%	0.4	2.6%	0.6	3.06	0.4%	11	0.5%	17
Peru	South America	193	2.7%	5.2	3.5%	6.8	16.26	0.6%	92	0.7%	120
Puerto Rico & US Virgin Islands	Central America	101	0.0%	0.0	0.0%	0.0	1.05	0.0%	0	0.0%	0
Suriname	South America	5	1.7%	0.1	3.2%	0.2	0.20	0.4%	1	0.7%	1
Trinidad and Tobago	Caribbean	25	1.7%	0.4	3.2%	0.8	0.66	0.4%	2	0.7%	4
UK BOT & Commonwealth	Caribbean	15	1.1%	0.2	2.1%	0.3	0.14	0.2%	0	0.4%	1
Uruguay	South America	51	2.5%	1.3	2.5%	1.3	1.64	0.5%	9	0.5%	9
Venezuela	South America	381	3.0%	11.6	3.0%	11.6	13.07	0.6%	83	0.6%	83
Caribbean		204	1.6%	3.2	2.4%	4.9	16	0.3%	51	0.5%	85
Central America		1,469	1.1%	16.5	2.0%	29.1	73	0.3%	217	0.5%	344
South America		4,422	1.5%	67.7	2.3%	101.0	197	0.3%	644	0.5%	962
TOTAL		**6,095**	**1.4%**	**87.4**	**2.2%**	**135.0**	**286**	**0.3%**	**912**	**0.5%**	**1392**

Source: World Bank; elaboration SEO

Appendix J Decomposition of GDP impacts into productivity and employment growth

	Tax Removal		Tax Removal and Charges Reduction	
	Employment increase (USD mln)	**productivity increase (USD mln)**	**Employment increase (USD mln)**	**productivity increase (USD mln)**
Argentina	6,951	25,018	10,076	35,506
Bahamas	13	51	49	180
Belize	4	14	5	20
Bolivia	220	802	288	1,041
Brazil	0	0	2,120	8,001
Chile	0	0	25	95
Colombia	2,934	10,724	4,216	15,182
Costa Rica	188	699	196	727
Cuba	66	251	66	251
Dominican Republic	392	1,443	537	1,954
Dutch Caribbean				
Ecuador	508	1,874	842	3,056
El Salvador	117	433	152	558
French Guiana				
Guatemala	322	1,186	322	1,186
Guyana	13	50	13	50
Haiti & French West Indies	24	88	62	228
Honduras	147	538	150	548
Jamaica	71	262	96	354
Mexico	2,506	9,401	5,120	19,013
Nicaragua	42	158	81	297
Panama	159	591	159	591
Paraguay	90	337	136	502
Peru	1,110	4,094	1,459	5,339
Puerto Rico & US Virgin Islands	0	0	0	0
Suriname	18	67	34	124
Trinidad and Tobago	89	332	169	619
UK BOT & Commonwealth	34	128	69	254
Uruguay	277	1,024	277	1,024
Venezuela	2,474	9,097	2,474	9,101
Caribbean	690	2,555	1,048	3,841
Central America	3,486	13,020	6,185	22,940
South America	14,595	53,088	21,962	79,020
Total	**18,771**	**68,663**	**29,195**	**105,801**

Appendix K Regression results

Data used

In order to provide estimates for the macro-economic impact of air transport growth, macro-economic data and air transport data were collected for the period 2001-2014, for all Latin American countries for which data were available. The macro-economic data are obtained from various sources, including CEPALSTAT, World Bank, WTO (World Trade Organization) and UNWTO (United Nations World Tourism Organization). Data on air connectivity were obtained from the SEO NetScan model, whereas passenger number were extracted from IATA PaxIS.

We provide estimates for the effect of a change in air connectivity on employment and GDP. In addition, we are interested in the wider catalytic impacts of improved connectivity and passenger growth:

- **Tourism.** Access to air transport is important for the development of inbound tourism. Inbound tourists generate value added effects, income effects and employment effects. Tourism is measured by the number of inbound tourist, as derived from UNWTO data;
- **Investment.** It is assumed that air transport, due to its reducing effect on transport costs, increases the likelihood of FDI exchange between connected regions. FDI leads to increases in local demand for labour, for instance to build up new production capacity and to increase the production of goods and services. Investment is measured by the net inflows of FDI, as a percentage of GDP. Data are derived from the World Bank;
- **Innovation.** Improvements in international mobility enhance the exchange, development and diffusion of innovative ideas, of technical progress and of product and process innovations. In this study, we measure innovation as the amount of total R&D expenditure as a percentage of GDP. Data are derived from the World Bank.

Model

To estimate the impact of an increase in air passengers on GDP, employment and other socio-economic variables we apply a fixed effects panel data model. This model is designed to explain the effect of changes of independent variables over time on changes in the dependent variable. We have estimated a specific constant for each airport, which represents the overall economic strength around the region in which the airport is located.

The model we use for our analysis is given by:

$$y_{it} = \alpha + \beta' x_{it-1} + \gamma' z_{it} + u_i + \epsilon \qquad \text{(C.1)}$$

Where α is the regression constant. The independent variables contain both airport-related and other socio-economic control variables which are not related to the airport. β and γ denote the vectors of the regression coefficients for these respective variable types. u_i is a specific constant for airport i, which captures the effect of all time-invariant factors influencing the economy around the respective airport.

In our model we control for both airport related characteristics as well as socio-economic variables. For airport related characteristics we tested the impact of both connectivity and passengers, broken down by international and domestic traffic. Socio-economic factors we control for include population, unemployment rate, GDP per capita and employment level. Furthermore, we include year dummies which capture year trends and autonomous growth.

We included separate year dummies for Caribbean countries, as the time trend for these countries appears to differ from the time trend in other Latin American countries. This is probably explained by the fact that the economy in those countries relies more on tourism from developed countries. As a result, the credit crisis and the European financial crisis have affected the economy in Caribbean countries relatively worse.

Causality

In measuring the effect of air travel on economic growth, endogeneity is a common issue. If there is a two-way causality between two variables, econometric estimators are not efficient and biased. This problem is widely acknowledged in literature (Mukkala and Tervo, 2012; Button and Yuan, 2013).

In this research we deal with the endogeneity issue by using a lagged connectivity variable. Hence we analyse the effect of a change in connectivity in year *t* on the region's economy in year *t+1*. It is rather unlikely that economic growth one year ahead causes connectivity growth in the previous year. Another common way to prevent causality is to use an instrumental variable estimator (Brueckner, 2003; Green, 2007). A good instrument would be a variable correlated with air connectivity, but uncorrelated with GDP per capita. As it is extremely challenging to find suitable instruments for connectivity, we prefer to use the lagged variable approach. Other studies use dynamic panel data models such as the vector autoregressive model (VAR) or generalized method of moments (GMM) (Button and Yuan (2013), Bilotkach (2015)).

There are various studies which estimated the impact of aviation on employment and GDP growth. To place our results in perspective with other findings from literature, a list of more or less comparable econometric studies is provided in the table below.

Paper	Key result
Poort (2000)	10 percent passenger increase leads to 1.7 percent GDP growth
Brueckner (2003)	10 percent passenger increase leads to a 1 percent increase in service related employment
IATA (2007)	10 percent increase in connectivity per capita leads to a 0.07 percent increase in labour productivity
Green (2007)	10 percent increase in boardings per capita leads to 0.3 percent population growth and 0.3 percent employment growth
Sellner and Nagl (2010)	10 percent increase in boardings per capita leads to 0.14 percent GDP growth
PWC (2014)	10 percent increase in seat capacity leads to a 1 percent increase in real GDP
InterVISTAS (2015)	10 percent increase in connectivity / GDP increases GDP per capita by 0.5 percent
Bilotkach (2015)	10 percent increase in the number of flights leads to a 0.1 percent increase in average wage; 10 percent increase in number of destinations leads to 0.13 percent increase in employment and 0.1 percent increase in the number of business establishments

Results

Table K.1 shows the regression results of connectivity on GDP and employment. Our results indicate that a 10 percent increase in international connectivity leads to a 1.33 percent increase in total GDP and a 0.28 percent increase in net employment. These results are in the same order of magnitude as the studies mentioned above.

Interestingly, international connectivity yielded more robust and statistically significant results than using total connectivity as a dependent variable. In the models used in this study we included international and domestic connectivity separately in the regression. The coefficients for domestic connectivity are insignificant, while there is a strongly significant and positive correspondence between international connectivity and GDP/employment.

As control variables for the regression of connectivity on GDP we used the unemployment rate, population and international trade (imports). As expected, changes in the unemployment rate have strong significant impact on GDP growth. The effect of population growth on GDP growth is insignificant. At country level population growth is mostly caused by births, which do not directly impact productivity or economic growth. Level of trade has a strong impact on GDP. Surprisingly the value of import shows a more significant correspondence than the value of exports or total trade value. This might be explained by the fact that a large share of exports is formed by products from the primary sectors, which might be more dependent on other factors such as weather conditions.

The year effects for Caribbean countries support the hypothesis that countries in this region have been affected more strongly by the European financial crisis. The coefficients are negative and significant in the years 2009, 2010 and 2011, indicating that the GDP growth was relatively lower in Caribbean countries in these years. For employment these effects are not pronounced into significant effects for the year dummies.

Table K.1 Macro-economic impacts

		GDP	Employment
Aviation variables (1 year lag)			
Direct cnx (international) (log; t-1)		0.1332**	0.0278**
Direct cnx (domestic) (log; t-1)		-0.0135	-0.0004
Control variables			
Unemployment rate		-0.0256***	
Population (log)		-1.0719	1.1145***
Trade (value of imports; log)		0.3539***	0.0314**
GDP per capita (log)			0.0033
year effects (2002 = reference)			
	2003	0.0510*	-0.0001
	2004	0.1061*	0.0103
	2005	0.1536*	0.0199
	2006	0.2786**	0.0272*
	2007	0.3617**	0.0410**
	2008	0.4303**	0.0425*
	2009	0.5498***	0.0492**
	2010	0.6309***	0.0531*
	2011	0.6633***	0.0555*
	2012	0.7102**	0.0604*
year dummies x Caribbean countries			
car_2003		-0.0638	0.008
car_2004		-0.0813	0.0069
car_2005		-0.0212	0.0074
car_2006		-0.1146	0.0157
car_2007		-0.1204	0.0121
car_2008		-0.1678	0.0133
car_2009		-0.1858*	0.0082
car_2010		-0.2458**	0.0011
car_2011		-0.2706**	-0.0061
car_2012		-0.2584*	-0.0087
Constant		31.8857*	-3.6108*
Number of observations		297	297
Number of countries		27	27
R^2 (within)		0.9343	0.9496

Legend: * : p < 0.1; ** : p < 0.05; *** : p < 0.01
Source: SEO analysis

Table K.2 shows the regression results estimating the impacts of connectivity on FDI, R&D expenditure and tourism. Only for tourism a strongly significant and positive relationship was found: a 10 percent increase in international connectivity leads to a 3.5 percent increase in the number of inbound tourists.

No significant correspondence could be found between connectivity growth and the level of inward foreign direct investments as a share of GDP. In fact, no significance was found for any of the dependent variables. This means that impacts of macro-economic developments on inward

FDI strongly differ between different Latin American countries. Possibly inward FDI is more influenced by economic development in the creditor's country than in the country they want to invest.

The impact of connectivity on R&D expenditure does not show a convincing positive correspondence either. Although at the 10 percent confidence level a positive relationship is found between domestic connectivity and R&D expenditure, the sign and magnitude of the coefficient for international connectivity casts too much doubt to base conclusions on these results. If total domestic and international connectivity is used as an independent variable instead, no significant relationship is found. It is possible that the low number of available data points increases the difficulty in finding statistically significant relationships.

Not surprisingly a strongly positive impact was found for international connectivity growth on tourism. A 10 percent increase in international connectivity yields a 2.2 percent increase in the number of tourists. Many countries in Latin America and the Caribbean in particular are important tourist destinations. An increase in connectivity leads to shorter travel times, increasing the attractiveness of the country as a tourist destination. In addition, ticket prices might decrease as a result of increased connectivity due to a higher supply of seat capacity or an increase in competition.

Table K.2 Wider catalytic impacts

		Inward FDI	R&D expenditure	Tourism
Direct cnx (international) (log; t-1)		-0.5762	-0.0729	0.2230***
Direct cnx (domestic) (log; t-1)		-0.0246	0.0241*	-0.0474**
Population (log)		-0.0779	0.8522	3.3270***
Unemployment rate		0.0562	0.0109	0.0058
GDP per capita (log)		-0.9857	0.2268***	0.1013
year effects				
	2003	-0.2766	-0.0242	0.0538*
	2004	0.6825	-0.0529*	0.1222***
	2005	1.6175	-0.0798*	0.1767***
	2006	2.1432	-0.1366**	0.1781**
	2007	2.57	-0.1671**	0.2032**
	2008	3.429	-0.1581**	0.1406
	2009	1.4442	-0.1513**	0.1605**
	2010	1.9108	-0.1879**	0.1701*
	2011	2.8738	-0.2432**	0.1816*
	2012	3.4395	-0.2499***	0.2006*
Constant		14.6854	-15.269	-46.9086***
N		286	138	308
Number of countries		26	20	28
R^2 (within)		0.1754	0.3001	0.7218

Legend: * : p < 0.1; ** : p < 0.05; *** : p < 0.01
Source: SEO analysis

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