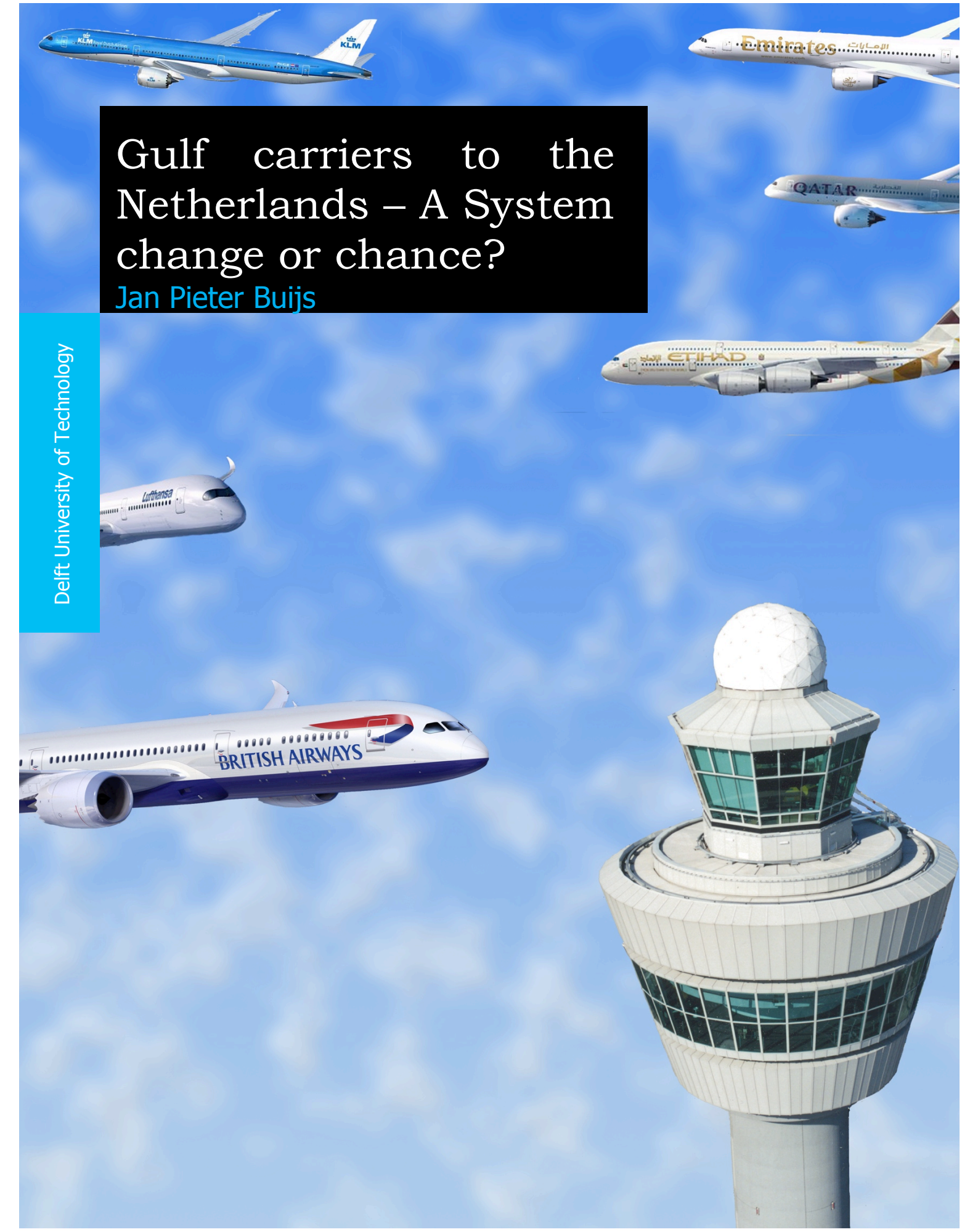

Gulf carriers to the Netherlands – A System change or chance?

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Challenge the future

Gulf carriers to the Netherlands – A system change or chance?

The economic system effects of new airlines to Dutch air transport

By

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Executive summary

Together Amsterdam Airport Schiphol airport and KLM form the largest chunk of the Dutch air transport industry. As the market for air transport in the Netherlands itself is too small, KLM developed a worldwide route network with many transferring passengers. Schiphol facilitates connecting passengers with the best possible experience. During prosperous times this business model can create leverage in growth for an airline network. But due to the small margins in the air transport market, this business model is proving vulnerable during failing times.

New carriers from the Gulf region have copied KLM's business model. Significant cost advantages (and some critics even claim state aid), have allowed these carriers to grow rapidly. Thanks to additional advantages, the Gulf carriers can outcompete legacy European carriers, including KLM. The social and economic effects of air transport are many-sided: direct, indirect and catalytic it stimulates a nation.

This research elaborates on the air transport system, with a focus on the Dutch situation, with the main question "*How do the Gulf carriers influence the economic contribution of air transport to the Dutch society?*". Using a mixed method approach, most issues are addressed with a small quantitative analysis, though the underlying structure is unravelled with a qualitative approach. Various methods are used, emphasizing on the various aspects of this research: a theoretical framework on influences and change, a study of the contribution of KLM to the Dutch society and the possible futures for the Gulf carriers.

Theoretically the air transport system consists of three sub systems: technology, market size and regulation. All sub systems are equally important, and have contributed to the evolution of the system into its current form. This structure is constantly subjected to changes, from both an endogenous and exogenous nature, resulting in temporary and permanent systemic transformations. The changes in market size of the various air traffic markets (Europe, U.S., Asia) over the years (due to globalisation) have fundamentally altered the air transport system, and enabled the Gulf carriers to take a key position in the system, as intermediaries between the old economies and Asia. Technology- and regulation-wise the Gulf carriers are docile to the old economies, although on the latter aspect early signs of trying to take a substantial role are visible.

The Dutch government considers KLM as very valuable for the Dutch GDP, both in a direct sense as well as indirectly via Schiphol airport, as a large employer and connector to the world – for tourists and business alike. Over half of the operations currently undertaken at Schiphol airport are attributable to KLM. However given the abovementioned trend in air transport, it is questionable whether KLM is irreplaceable. Wider effects of this possible event – for example de- or re-hubbing of Schiphol – are uncertain, partly due to a missing political vision. Looking at examples of re-hubbing at Brussels, Budapest and Zürich airports, volume wise the impact of a defunct airline on the hub-function of an airport is limited. But in terms of connections and network, multiple visions are possible.

When the Gulf carriers are analysed, one cannot but conclude that they employ similar business strategies. Emirates uses large, high-capacity aircrafts and high frequencies to forge its own airline network. Etihad buys airlines all over the world to create an equity alliance. Qatar resembles the more traditional strategy, cooperating in one of the old alliances. Looking at this strategic differences is interesting, as they can lead to different outcomes, when costs become an issue more than they do now, for instance due to a decrease in government funding of air transport. Emirates seems to have the most stable financial outlook, with reasonable ticket fares and a stable network. The other two might be more dependent on external sources of funding (i.e. government money), which could undermine a part of their business model.

The research concludes that there is a possible future perspective which the Gulf carriers are a threat to KLM, eroding the profitability of its network – especially transfer passengers from the UK. This can be reflected in the operational volumes at Schiphol, and thus the Dutch GDP. However this assessment is dependent of the political vision used. De-hubbing theory and practise show volume wise a ceasing hub airline is not significantly affecting an airport. But in another perspective , for instance connectivity, de-hubbing can lead to a significant decrease in destinations, and thus network quality.

Without government interaction it is likely the Gulf carriers will evolve to a role that is comparable with other competitors of KLM at Schiphol. Currently their operations at Schiphol do not erode KLM's network. Consequently, it could be concluded that the Gulf carriers are a valuable addition to the Dutch air transport system that increases the network quality and connectivity, without derogation of KLM at Schiphol.

Despite this seemingly comfortable conclusion, there is a point of attention. Currently the Dutch government does recognise the importance of a strong network, but has no policies in force to ensure the current network quality. Without a clear vision and policies by the Dutch government on the role of air transport, it is not possible to answer the question of the effects of the Gulf carriers to Dutch society, as answers cannot be interpreted.

Preface

As lubricant of the world economy, air transport is a fascinating industry. The rapid development of aircraft technology, after mastering the magic of flying by the Wright brothers in 1903, is truly one of the most significant inventions of the last century. But the continuous innovation also has a flip side: policy and management aspects cannot follow the pace of the technological developments, making air transport a complex system, with tense relationships. One of the aspects with the system, came up last decade, is the carriers from the Gulf region, which aggressively take a significant market share on route to and from South (-East) Asia.

Last months I have tried to unravel these relationships with pleasure, to map the air transport system, and to assess the impact of the Gulf carriers to Dutch society. I have used a mix of methods to do so, including an extensive literature research to combine the different aspects, quantitative analyses on parts of the system and interviews. The result of my efforts is laid down in this master thesis, which is structured into five chapters. For the reader with little time a summary is included, but for more details chapter 2 provides a theoretical base, while chapter 3 elaborates on the situation of KLM at Schiphol, and chapter 4 explores the role of the Gulf carriers. For extra readability, above every sub part the studied research question is repeated in italics, and ends with a short summary or section conclusion, also in italics.

I hope you enjoy reading my thesis, but not before I have thanked a few people for their contribution to my thesis. First Mark de Bruijne, my first supervisor, and the other members of my supervising committee, Bert van Wee and Alexander de Haan, who have directed my research with feedback, theories and other research suggestions, while giving me space to follow my own ideas. Second I want to thank the people who provided me with inside knowledge of the industry, especially my interviewees, Jaap de Wit, Joost Zuidberg, Wilco Sweijen and Pieter Cornelisse, for their wisdom and data. Also I want to thank Dorine Duives for proof reading my thesis. At last I want to thank my family and friends, for their support, and withstanding me during my graduation period.

Jan Pieter Buijs
Delft, January 2015

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Introduction - System complexity

Scheduled air transport is a relatively new industry, starting last century. It is a **complex sector**, with many stakeholders: airlines, aircraft manufacturers, airports, suppliers, national politics, international politics, and etcetera. It is also very closely connected with national economies, as it brings welfare to countries by generating employment, and enabling trade and tourism (Smyth, Christodoulou, Dennis, Al-Azzawi, & Campbell, 2012).

Because aircrafts are not bound to set routes, infinite routes (city pair) do exist. Even with the institutional (legislative) boundaries that curtail the freedoms of moving through air, **competition among airlines is high**. The industry is renowned for its fierce level of competitiveness. It is hard to run a company while writing black figures. According to Doganis (2009) and Morrell (2007) high costs, thin margins and complex operations make it hard for airlines to survive. Nonetheless, it is a booming sector, with a forecasted average growth of the Revenue Passenger-kilometres (RPK, the most including KPI of air transport, see Annex D) worldwide of 5.0% annually (Boeing, 2013).

Air transport is known as a sector with sometimes-erratic market behaviour. Take the example of Iches (2005): the route Nairobi, Kenya to Lagos, Nigeria: in 1999-2000 45,000 passengers travelled this route, and that number almost doubled to over 80,000 in the following years. But in 2004 the number was back to 60,000. Whereas market behaviour is often related to economic events, Iches also suggests the reasons behind this erratic behaviour. First the national airline of Nigeria, Nigeria Airways went bankrupt in 2004 (Morrell, 2007) due to fraudulent management (Godson, 2003, p. 148). In addition Emirates started a route to Lagos from Dubai on January 2, 2004 (Maslen, 2014), lowering the importance of Nairobi as a hub to Asia by Nigerians.

Erratic market behaviour of air transport is not caused by large forces; small events or interventions can change just an element of the system and can trigger a chain reaction (Wensveen, 2012). This makes it harder to foresee the results of certain actions. The results can be analysed ex-post, but when the **underlying structure** is more transparent, the structure can be used to look into the future, to see consequences of events or interventions.

In the past two decades major power shifts are visible in air transport. Fan, Vigeant-Langlois, Geissler, Bosler, and Wilmking (2001) notice how mergers in Europe and North America result in large airline **conglomerates**, while O'Connell (2011) describes the drastic change in the Middle East, with the **emergence** of several new airlines in the **Gulf Region**. Incumbent European carriers suffered from large cost-cuts due to rising costs (fuel in particular, see Moody (2012)), while these new airlines spent money like water (see Annex C for an overview of the airlines of each category). Excessive aircraft orders (according to CAPA (2014a) more than twice as many orders per current aircraft in service as in Europe and North America) and competitive fares have gained the new Gulf carriers a significant position – approximately 15% of the total passenger volume (see Amadeus, 2013) - in air traffic between Europe, South/East Africa and South/East Asia.

As illustrated by CAPA (2010), legacy European carriers perceive this growth of Gulf carriers more and more as a **threat**. In particular Air France/KLM and Lufthansa complain bitterly about unfair advantages of the Gulf carriers. The Gulf carriers refute these accusations, and (European) policy makers and airports tend, despite the possible impact, to ignore this trend.

To assess the systemic changes, caused by the Gulf carriers, this research poses the following main research question:

How do the Gulf carriers influence the economic contribution of air transport to the Dutch society?

Decomposing this research question, one can distinguish four separate elements/levels. Zooming in from the highest level, these elements are:

1. Air Transport
2. Economic contribution
3. Dutch society/situation
4. Gulf carriers

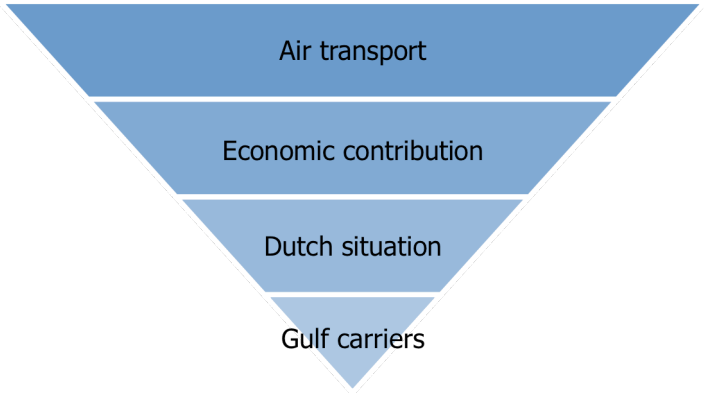

Figure 1 Zooming to the problem from the main question

In Figure 1 the elements are displayed, to illustrate the focus steps of this research. Looking top-down, zooming in on the problem, the highest level in this problem hierarchy is the air transport system, while on the lowest level the Gulf carriers can be found. In the following subsections, each of these elements is introduced.

Air transport

The highest level of this research is the air transport system. In this research air transport will be defined as **the part of civil aviation focusing on scheduled passenger and cargo transport**. Despite being almost 35% of the world trade in value (O'Connell & Williams, 2011), cargo often accounts for just a small part to the revenues of an airline, see Table 1. Therefore, the focus will be on the former group, passengers, as it is the main driver for air transport. But cargo cannot be excluded, as it often is transported on passenger aircrafts, generating the margin of airline, whereas passengers cover the operational costs. Cargo-only operators will not be included in this research, as they are a small part of the market; only 10 to 15% of the air cargo is transported by a cargo airline (Popescu, Keskinocak, & Mutawaly, 2011).

Table 1 Turnover by cargo as a percentage of total turnover, in billions of local currency (Source annual reports of airlines)

Airline	Cur-rency	Total turnover	Cargo turnover	%	Fiscal year
Air France-KLM	EUR	25.52	2.82	11.1%	2013
Lufthansa	EUR	30.028	2.442	8.1%	2013
Emirates	AED	82.636	11.3	13.7%	2013-2014
Singapore Airlines	SGD	15.244	2.248	14.7%	2013-2014

Often research on air transport considers the topic from an economic perspective: air transport is considered a market, research uses an economic rationale, and accompanying econometric quantitative research methods (see also Methodology on page 7). However, air transport is more. It is a worldwide market with many players, with many airlines and airports as key stakeholders, and additional stakeholders like manufacturers, regulators, travel agents and many more. Its global character and national interests makes regulation challenging. In this research air transport will be approached as a system, as it better incorporates the multi-actor elements and the mutual dependencies. As air transport is a system with both social and economic components, in this research it will be considered as a **socio-economic system**.

Economic contribution

The second level of the focus is economic contribution. Air transport contributes in multiple ways to regional economies. It generates employment at airlines, at airports and often also in the proximity of the airport. Whereas the first and second group are often easy to calculate, the contribution of the last group is more disputable. In a narrow definition, members of the group exist of suppliers of airports and airlines, but in a broader definition it also includes the (extra) businesses due to the accessibility of the area, and tourist organisations.

There are multiple types of airlines. Cento (2008) defines the types as: **Full-service carriers** (FSCs), **Low-cost carriers** (LCCs) and Charter carriers (CCs). The latter nowadays often seem the same as LCCs, as Williams (2001) states. Initially only FSCs did exist, but as by-product of the deregulation of air transport LCCs came into play, mainly on profitable short-haul air routes. Many FSCs are established by governments, as national flag carriers, and nowadays most are still (partly) state-owned enterprises, as Emirates (2014b) explains. To extend their operations, these carriers have adopted a **hub-spoke** (HS) network strategy. The main concept of a HS-network is to transfer passengers and/or goods at a central hub (airport). This is in contrast with low-cost airlines, which operate with a **point-to-point** (PP) network strategy. While PP focuses on cost efficiency, HS tries to maximize the number of connected city pairs by focussing on connectivity via a hub, as Alderighi, Cento, Nijkamp, and Rietveld (2005) notice. Burghouwt and Hakfoort (2001) explain the main advantage of a HS strategy, which is that it combines point-to-point traffic and transfer traffic, enabling more destinations or higher (daily) frequencies, even if the domestic market is insufficient. One network strategy is not altogether better than another, as implied by both are still used widely, although HS is more common for intercontinental traffic.

For the economic contribution of an airline, a distinction can be made between different types of airlines. Low-cost airlines and hub-airlines at outpost destinations transport more O/D-passengers, than hub-airlines at their home-airport, but they require less local staff than home-carriers (which have for instance a head quarter, customer services or marketing offices in the area). And although transferring passengers are not contributing to regional economies, they spent more at airport while waiting, and enable hub-airlines to operate at increased frequencies, attracting premium O/D-passengers.

These **vague system boundaries** and **conflicting interests** make it hard to calculate the exact effects of airlines. But, as MacKenzie (2010), both national prestige and economic advantages are equally important, and thereby it is interesting for a nation to develop a solid air transport industry.

Dutch situation

The third level of this research is focus on the role of air transport in the Dutch society. Currently it is mainly composed of the primary airport in the Netherlands, **Amsterdam Airport Schiphol**, and its largest home carrier, **KLM**, as only Dutch FSC responsible for the lion's share (more than 70%) of passenger traffic from and to the Netherlands (domestic traffic is absent). Other commercial airports (Eindhoven, Rotterdam The Hague, Maastricht and Groningen) and airlines (Arke, Corendon, easyJet, Ryanair and Transavia) have a much smaller market share. Also they do not operate a hub spoke network, but focus mainly on (PP) leisure traffic. Because of these different traffic characteristics, these airports and airports are only affected by the Gulf carriers to a very limited degree.

To overcome the disadvantage of a small catchment area at its home airport, KLM has performed a trick, by using transfer passengers. Offering a **transfer** product to foreign passengers enabled KLM to operate a far larger airline network than is necessary to serve the local market. Although the larger network looks more robust because of its size, this business model is in fact vulnerable (Murel & O'Connell, 2011). The thin margins, such as ticket revenues, have to be split between two flights – instead of one. According to Hanlon (2007) most airlines accept a (small) loss on these feeder routes, as long as it is **compensated** with profits on the intercontinental routes. But limited price elasticity of demand leads to cuts to compensate on the costs side instead. To remain profitable, KLM's CASK has to be lower on all flights than competitors with more direct flights, who don't need to distribute the profits over multiple flights.

KLM's business model is attractive for small nations, as with limited requirements foreign revenue can be generated. Other small (island) states implemented this business model as well, like Hong Kong, Iceland and Singapore, making advantage of their location, transferring passengers from a foreign country to another foreign country, via its home airport.

Gulf carriers

The lowest level of the research focus is the influence of the Gulf carriers. Oil and gas discoveries led to rapid economic developments in the Gulf area. As many of these countries wanted to be less dependent of oil and gas benefits, and have ample space for airports and capital for airlines, many started to establish airlines and hub airports. They used the same business model as KLM, transporting goods and passengers via their hubs, as their home market

is limited (de Wit & Burghouwt, 2009). The **vertical integration** of the national airport, airline and government (regulator), by involvement of the local royal families, has helped the Gulf carriers to develop very quickly, as Burghouwt (2012) notices.

The rapid growth of these carriers from the Gulf region, often referred to as Gulf carriers (see Annex C), can undermine the position of the European legacy hub carriers. Both groups of carriers operate on routes between North America, Europe, Africa and Asia, and partially rely on transfer traffic to maintain their network size, but the Gulf carriers have cost advantages over the legacy carriers. These advantages are the result of how local societies are organised, although some (like Delmar-Morgan, 2012) say it is thanks to government subsidies and petrodollars. As solid evidence of unfair or cross-subsidies is absent, this research will not assess the levelness of the playing field, and only take the geographical and societal advantages into account.

Legacy carriers express their fear of the Gulf carriers in the press releases, interviews and memos to local governments. For example, KLM's former CEO, Peter Hartman, as quoted by Stil (2011) warns that Europe should focus more on air transport, otherwise it will lose its market position, which was built over the last 90 years. Although the effect of the Gulf carriers is hard to forecast, this research will aim at mapping the risks and vulnerabilities specifically for Dutch air transport and Dutch society.

Problem owner

Multiple government departments in the Netherlands have policy areas with interfaces with air transport. The department of Safety and Justice (V&J) is responsible for the safety of civil aviation (Rijksoverheid, 2015a), the department of Economic Affairs (EZ) is responsible for the contribution, knowledge and innovation of air transport, especially (suppliers of) aircraft manufacturers (Bureau Bartels, 2010), Finance has stakes in Dutch airports and KLM (Rijksoverheid, 2015c), and **Infrastructure and Environment (I&M)** is responsible for all other aspects of air transport (Rijksoverheid, 2015b).

As **ultimate responsible** department, I&M is the most appropriate actor to be considered as problem owner in this research. Like all other departments, the responsible State Secretary at I&M, Mansveld (2012), did not acknowledge the possible impact of the Gulf carriers. However, as De Jong (2014) notes, in late 2014 she admitted to investigate the impact of the second daily flight of Emirates to Amsterdam on KLM's network, in close consultation with KLM. However, her correcting potential is limited, and she does not want to protect KLM, as it is a private company. This view is in line with the **current policy vision**, recognising the importance of KLM and its network:

"*This network of connections is the result of the efforts of the airlines, particularly KLM, the government and Schiphol. The network is especially large thanks to the hub function of the airport: many foreign passengers use Schiphol as transfer airport. Via transfer passengers KLM can maintain direct connections that otherwise would not be economically viable.* " (Rijksoverheid, 2009, p. 25)

Nevertheless this leaves the problem owner a thorny problem: can she stimulate actors to maintain or improve the Netherlands as transportation-hub, without discriminating (foreign) parties? Competition on individual routes can have positive effects for the transportation-hub function, but on the network level it could have a devastating effect.

Nowadays **no policy** limits the activities of Gulf carriers in the Netherlands. In fact, as I&M focuses on an open market: the Air Service Agreements (ASAs) between the Netherlands and United Arab Emirates and the Netherlands and Qatar based on an open skies principle – unlimited frequencies and capacity – while policy on how to deal with unfair or dangerous international competition for home carriers is lacking.

Research focus

As the competition of the Gulf carriers and the complaining by legacy carriers has been ongoing on for a few years, more research is done on this topic. While Gulf carriers commission research to substantiate the positive impact of their services (Grimme et al., 2012), legacy carriers try to emphasize the impact of air transport to raise awareness for their indispensable role in society, and try to proof unfair competition (Lufthansa Group, 2015).

To use a broad scope, this research observes air transport as a system, instead of a market (see Figure 2 for more information on the difference between a system and a market). By studying the system behaviour of air transport,

other perspectives can present itself, which are transcending a single sub system. For example the flexibility of a system can have an economic outcome, triggered by non-economic elements in the underlying structure. Decomposing the structure can help to understand the behaviour of the system.

As the air transport system has many relations, often complex, analyses on an abstract level are pursued. By using this level more elements of the system can be included, discovering the relations between sub systems, without losing overview.

Questions

In this research, the Dutch government (I&M) is governing stakeholder. This research focuses on role of air transport in Dutch society, the influences of the Gulf carriers to the system, and the influence of the problem owner on this system. Is their **vision** making the Netherlands a significant transportation-hub, also in air transport, and is this reflected in current policies, is there space for Gulf carriers in this vision, or will the Netherlands as air transport hub become an **illusion** because better foreign alternatives are possible?

The main question, ***How do the Gulf carriers influence the economic contribution of air transport to the Dutch society?*** starts focussing on the current situation, in order to assess possible future situations. The main question can be decomposed into three sub questions:

1. ***How can systemic changes in air transport be assessed?***
    a. *How is the system air transport structured?*
    b. *How can the system air transport deal with different types of influences?*
    c. *Which theories can help explain changes in air transport?*

2. ***What is the value of KLM to Dutch society?***
    a. How are air transport and regional economies connected?
    b. How much does Schiphol dependent on KLM's operations?
    c. What will happen to an airport when a home-carrier ceases its hub-operations?

3. ***Which future scenario is most likely for each Gulf carrier?***
    a. *How did the air transport playing field with the Gulf carriers develop to its current situation?*
    b. *Which scenario presents a possible future for the Gulf carriers, based on the current playing field?*

In Figure 3 the mutual relations between the questions are shown.

System versus Market

Why is this research looking at air transport as a system rather than a market? The word **market** is often used as an economic term. It assumes **economic rationale** of behaviour: players strike a trade balance between demand and supply, paying the lowest price. The word system is more used in an **engineering perspective**. A system is a group of cooperating components, which, subjected to external parameters, will produce a joint output. Assessing a system deals more with the underlying structure, than focussing on output like in markets.

Figure 2 Difference between a system and a market

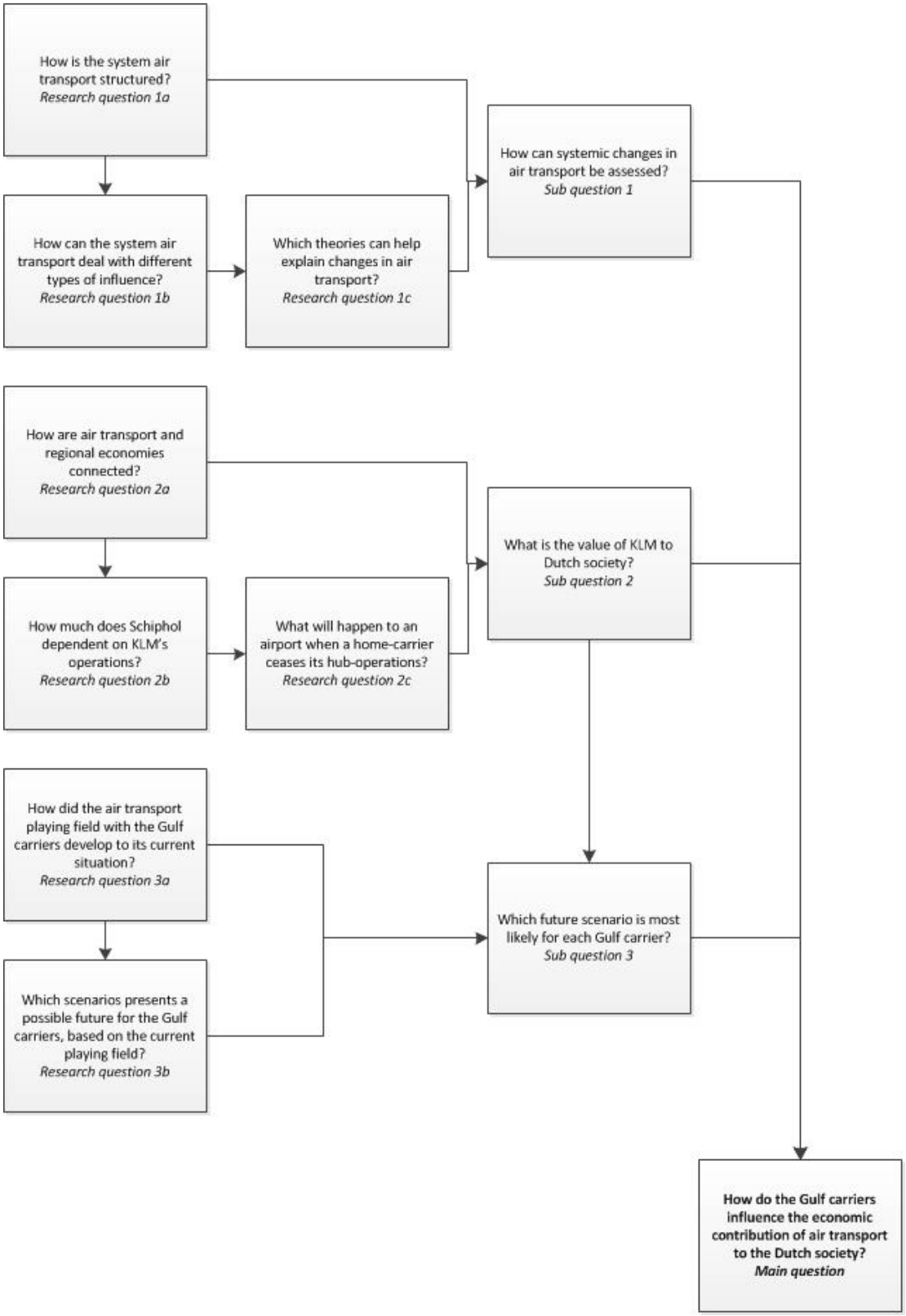

Figure 3 Question structure research

Methodology

Much data is available on air transport. Trade associations like the International Air Transport Association (for airlines) and Airports Council International (for airport)[1] have data on airline routes, airport volumes, capacity and performance, as well as information on technology, health and safety, security and global economics. Many private organisations, like OAG, CAPA, Flightglobal and CH-aviation[2], offer this data as well, enriched with news and analyses. Together this offers a great overview of the impact of the Gulf carriers on the air transport system. However this impact will be merely on volumes.

The impact for airline networks and regional economies at other hubs, outside the Gulf region, is hard to assess with just data. Complex relations and unexpected reactions can turn positive effects at a level into negative impact at another level. For example increased competition on a route can lead to additional capacity and lower ticket prices, which is positive for passengers on both ends of the route. But the declining yields can start a chain reaction, eroding a hub airline's network: transfer traffic might become not profitable anymore, feeder routes are shut down, leaving only a handful of routes with enough demand for a direct flight without transfer traffic.

Also many researchers have dealt with the issue of the Gulf carriers. Conclusions vary, as often a specific segment of the system is researched. Vespermann, Wald, and Gleich (2008) recognise the threat for primary airports with airline hubs, when demand drops below a critical mass, while secondary airports profit of increased passenger numbers and direct intercontinental connections. Lohmann, Albers, Koch, and Pavlovich (2009) list some advantages of one of the Gulf carriers, Emirates, including costs advantages over legacy airlines and the fact airport, airline and the regional air transport regulator have the same owner. Murel and O'Connell (2011) notice the similarities between the Gulf carriers and KLM, all being highly dependent of transfer passengers due to a small local catchment area. O'Connell (2011) lists Emirates' competencies, including cost advantages and its geographical location. Also some research is focussed on a specific region, especially Germany due to the strong anti Gulf carrier lobby of Lufthansa (Forsyth, 2014; Grimme et al., 2012; Lufthansa Group, 2015; Mandel & Schnell, 2001). The Dutch situation is less well-researched, although Burghouwt (2012) and Lieshout (2012) make a start with comparing KLM with the Gulf carriers.

Important to notice is different viewing points can lead to different assessments. Different stakeholders have different interests (sometimes conflicting), but also on a route level effects can be opposite to a network level. It such a case it can help to look at the underlying structure, as Rosenberg (1982, p. vii) suggests, because "*by doing so a number of important economic problems can be powerfully illuminated*".

To do so, this research is structured in three consecutive parts, each seeking specific knowledge based largely on existing research: a theoretical framework, an analytical part on the role of air transport in the Netherlands, with a focus on Schiphol and KLM, and a more hypothetical analysis on the changes to the system by the Gulf carriers.

The first research question elaborates on the construction of a framework to assess systemic changes in air transport (sub question 1). To create this framework a grounded theory approach will be followed, as described by Corbin and Strauss (1990). First step is to analyse the interrelated processes, followed by determining the unit of analysis. Then a categorisation is introduced, followed by theoretical grounds to establish "concepts, their properties, dimensions, and variations" (Corbin & Strauss, 1990, p. 8). Also behavioural patterns are accounted for. Together all these steps lead to a case specific theoretical framework, which to a certain extend can also be used for other influences in air transport.

The second sub question is to discover the economic value of air transport to economics, in particular in the Dutch situation. Multiple consultancy organisations have stated numbers, often a percentage or absolute number of the GDP contribution, which can be accounted to air transport. Cornelisse (2014) states 26 billion euro, based on research of McKinsey and BCG, while the number of Oxford Economics (2014) is less than half (11.8 billion). This large range can be explained by the vague delineation of the contribution of air transport, and is an example for biased research in air transport. This makes it hard to compare individual nations, although it will be done to explore the national differences in contribution of GDP. Afterwards a more theoretical approach will be used, to deduce the connection between the type of air transport of a nation and its regional economic benefits.

[1] For more information, visit their websites: http://www.iata.org/ (IATA) and http://www.aci.aero (ACI)
[2] For more information, see: http://www.oag.com/, http://centreforaviation.com, http://www.flightglobal.com/ and http://www.ch-aviation.com/

The second part of this sub question will zoom in on the situation of Schiphol with KLM, as the most contributing airport and airline to the Dutch economy. A few quantitative analyses on capacity, routes and de-hubbing will be conducted to prove the importance of KLM to Schiphol, as well as e uniqueness of their route network. The last part of this sub question will illustrate what can happen when a hub carrier ceases its operations at an airport.

The last sub question of this thesis deals with the role of the Gulf carriers in the system. It will start with quantitative analyses of the role of the Gulf carriers in the current system, in comparison to the role of legacy carriers. Following is a part that explores the future of the Gulf carriers, by means of simple scenario sketches.

Multiple methods and data sources are used in this research. In broad terms this research is composed of a combination of a literature review and a number of quantitative analyses on data from various sources. The last two sub questions are also supported with a number of interviews. In Annex B a full overview of the methods and data, as used per research question. is provides, as well as their justifications.

This research has qualitative and quantitative components, as stated earlier in this section. Many authors have dealt with the issue of how to combine both types of research methods into an integrated research design. Bryman (2006) lists some, including their various terminology for the concept: "*multi-methods (Brannen, 1992), multi-strategy (Bryman, 2004), mixed methods (Creswell, 2003; Tashakkori & Teddlie, 2003), or mixed methodology (Tashakkori & Teddlie, 1998)".*

The exact terminology is less relevant, as the focus is on the similar principles: how to integrate qualitative and quantitative research methods. Bryman (2006) summarizes some aspects, important for mixed methods:

1. Priority
2. Function of integration
3. Moment of integration

As implies in the formulation of the main question, the focus of this research is a qualitative study. So the priority of this research will be on the qualitative elements. The function of integration is exploration. Quantitative data is used to set a starting point for a more abstract concept. Thus the moment of integration is the phase of question formulation: quantitative data is used to set the problem, where after qualitative the underlying structure is researched. According to Mason (2006), this way the multi-dimensional research elements can be linked best, as required to answer the main question.

2

Dynamics of the air transport system

In the previous chapter the problem is explained. First step for solving this problem is creating a framework with theories on how to assess influences to the system. Like many systems, air transport is continuously prone to influences and change. These influences and succeeding changes come in various forms and sizes. For example, to show the variety, stricter environmental laws, improved technology, different routes, new airlines, it is daily business in air transport. The first part of this chapter will focus on the variety of the system, by exploring the structure, to answer the research question 1a "*How is the system air transport structured?*".

The influences to the system have multiple origins. Some have an exogenous nature, while others are endogenous, actions of parties in the industry itself. Also the effects vary; from hardly have impact on the system to turning the system upside down. The second research question "*How can the system air transport deal with different types of influences?*" will be answered with the creation of a framework to structure these different influences and changes.

The last part is to answer the research question "*Which theories can help explain changes in air transport?*". There is no single theory to describe the changes in air transport. Thus multiple theories will be used, to enlighten the influences and changes.

Combined the results of these three research questions will answer the first sub question "***How can systemic changes in air transport system be assessed?***" with a framework on influences, changes and applicable theories.

Structure of the system

Research Question 1a: How is the system air transport structured?

Looking back in history, the earliest signs of air transport are more than two centuries ago, with hot air balloons and zeppelins (air ships), see Thomas (2009). Nevertheless this paragraph will focus only on the last century, since the start of the first airline, DELAG (Deutsche Luftschiffahrts-Aktiengesellschaft. In English: German Airship Transportation Corporation Ltd). Suau-Sanchez and Pallares-Barbera (2013) assume there are three co-evolving elements that formed air transport: technology, market size and regulation. Each sub system has its own developments, but there is also overlap. Within the intersection of all three sub systems air transport can be placed.

The developments of all three sub system are described briefly below, to provide an understanding of the content and change over time of each sub system.

Technology

In the early years the **capacity** and **range** of aircrafts was very limited. Rodrigue, Comtois, and Slack (2013) say the system suffered by these limitations, but reflecting the system adapted to the historical possibilities. When the capacity was limited, only mail (cargo) was transported, or fares were higher. And with limited range, multiple stops en route were common.

The development of capacity and range often went hand in hand; newer types of aircraft had often better performance in terms of capacity, speed, range, more fuel efficient and less noise emissions. It was a race between manufacturers from Europe and the United States to innovate aircraft technology. IATA (2014) describes the technological era milestones briefly, with the introduction of turbo-propeller aircraft in the early 1950s, the first jets in 1958 and the first wide-body (high capacity) aircraft in 1970.

As a result of the increased capacity and range airlines operated different aircrafts. Whereas the first aircrafts were small in capacity and range, they carried only a limited number of passengers and required many (intermediate) stops, as Rodrigue et al. (2013) describe. Extended ranges and larger aircrafts allowed more stops to be bypassed, limiting the geographical dependencies for airlines, which could focus more on market demands instead. Eventually this led to the hub-spoke (HS) networks we know today, which is used by many large airlines, with hubs in large cities.

Market size

In the old days many intercontinental air services went to **colonial territories**. For example the appropriately named Imperial Airways, like Pirie (2004) noticed, connecting London with Africa, India, other Asian outposts, and Australia (in partnership with Qantas Empire Airways). The airline was subsidized by the government, and used by officials to travel to overseas territories.

Slowly air transport became more accessible for the working class. Even though airfares were still high – it could be as high as an annual salary – more and more business people and later tourists used air transport. After the Second World War traffic in and to the United States grew, as Brooks (1967) describes, as air transport started to be commercially viable (making profit without subsidies). Later **globalisation** broadened the focus of air transport from mainly Europe – United States (Transatlantic) to also Asia-Northern America (particularly Transpacific) and between Europe and Asia. Especially the latter market offered opportunities for intermediate hubs in the Gulf region, as it is geographical central and intermediate between numerous city pairs.

Regulation

Many countries see airlines as important national companies, due to, as Smithies (1973, p. 1) states, "*its importance in defence, trade, diplomacy and national development*". That is why international air transport is strictly regulated, as agreed upon in the Chicago convention regulated in bilateral air service agreements. According to Cento (2008, p. 14) this all changed in 1978, when the United States started to liberalize its domestic market. They deregulated the airlines, which resulted in the emergence of private low-cost carriers (LCCs). Other countries followed the **deregulation** of the air transport industry, and many nations (partly) privatized their flag carriers. Also ASAs became more and more multilateral, removing many restrictions. Although the effects of the liberalisation are huge - InterVISTAS-ga2 (2006) discovered traffic growth up to 100% and many new jobs – they also noticed still countries

are protecting their flag carrier. In Figure 4 an overview is presented of the levels of liberalization in the various air transport markets.

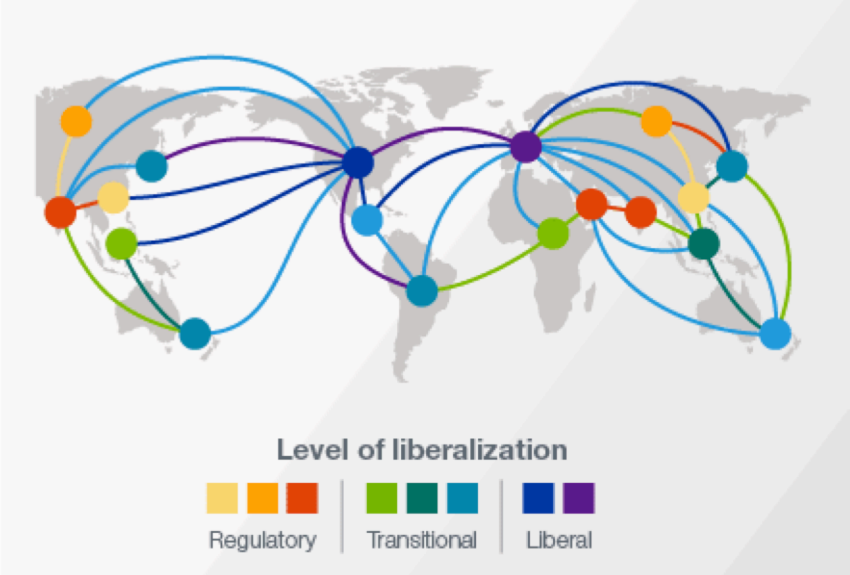

Figure 4 Level of liberalization (Boeing, 2013)

Another remarkable change in the ASAs is the opening of various air spaces. For instance during the Cold war, foreign air traffic was restricted over the USSR. This resulted in significant detours, for instance flights between Europe and Eastern Asia were routed via Alaska, making an intermediate stop in Anchorage. The more open airspace nowadays reduces the detours, although restricted airspaces still exist, for instance above war zones.

When all three sub systems, Technology, Market size and Regulation, are taken into account, Figure 5 can be drafted. It shows the separate sub systems, with overlapping areas. For instance the intersection between technology and market size, contains elements like capacity and range. Smaller and more efficient aircrafts, like the Airbus A350 and Boeing 787, make it possible to operate more direct long haul connections, thus bypassing hubs. An example of the intersection technology & regulation are the air transport safety standards, which are in force worldwide, and are continuously updated because of new technologies and accident investigations. The intersection of market size and regulation contains for example the Air Service Agreements with restrictions on capacity and/or frequencies. The three-intersection in the middle is where air transport as a system can be found.

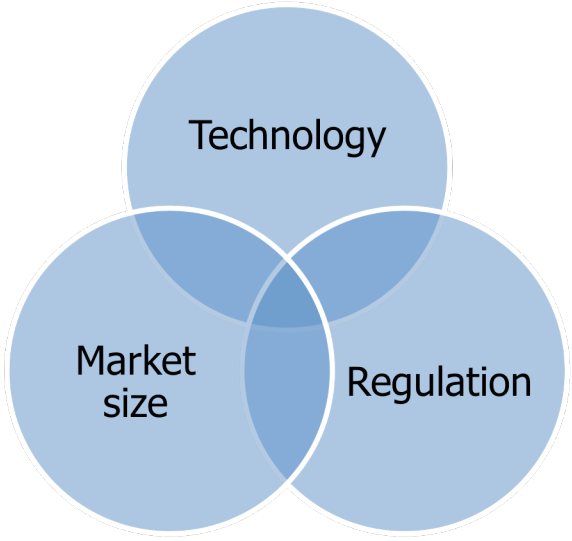

Figure 5 Sub systems of air transport

Flexibility of air transport

Research question 1b: How can the system air transport deal with different types of influences?

Air transport is an **over-quantified** industry. Almost everything is measured, monitored and registered (see Methodology on page 7 for a number of data providers and analysts). Thanks to this data, airlines are capable to optimise their operations, and operate profitable despite the small margins in the industry. To monitor the performance of the market as a whole, the key performance indicator **revenue passenger-kilometres** (RPK) is often used. It combines distance and passengers, which is not comprehensive, but the best indicator for passenger airline performance, as can be seen in Annex D.

System behaviour

In Figure 6 an example of RPK-development is plotted. It contains a 10 year graph with monthly RPK data, and a trend line, calculated by Brauer and Dunne (2012), to correct for seasonal fluctuations (the Christmas season and summer holidays are every year busier periods).

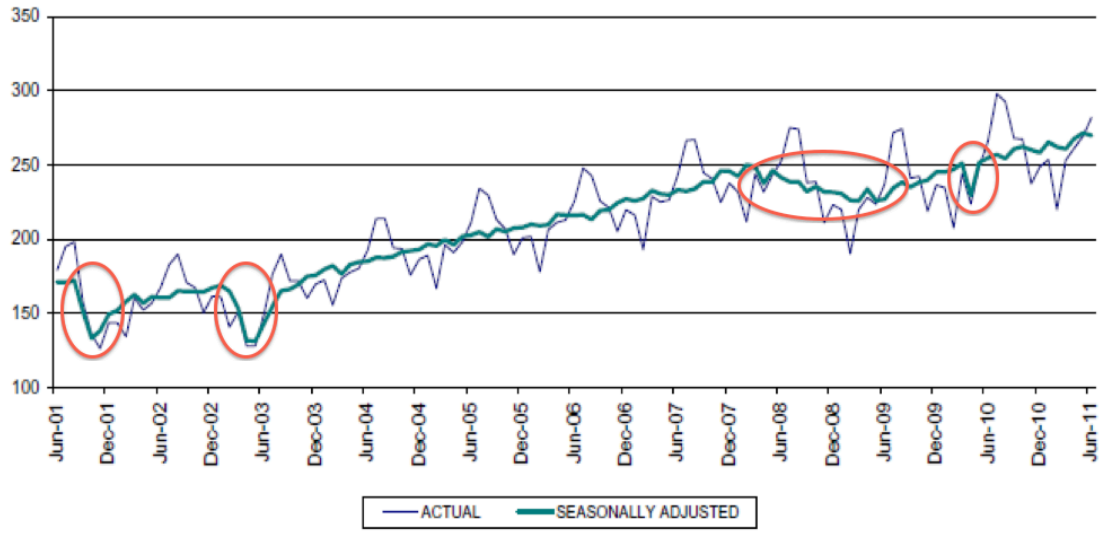

Figure 6 Revenue passenger kilometres (RPK) for international scheduled passenger traffic, June 2001 to June 2011, industry total. Compiled by Brauer and Dunne (2012) with IATA data

When observing the adjusted trend line in more detail, four dips can be recognised, highlighted with red ovals. Three troughs are quite sheer, the third dip is longer but less deep. All troughs have an exogenous nature: the first trough is caused by terrorist attacks (9/11), the second is caused by the invasion of Iraq and the SARS pandemic, the third is caused by the U.S. subprime mortgage crisis and the forth is caused by the Euro crisis. After each trough recovery is visible. Although it can take a few months to reach the pre-dip RPK-level, the exogenous event did not led to permanent damage for the system.

To understand how it is possible that these events do not change the system permanently, it is necessary to take a look at the underlying system structure, see Figure 7. It shows the system dynamics model, as developed by Pierson and Sterman (2013), with three categories of exogenous influences (highlighted in red). All events mentioned earlier are exogenous influences on demand.

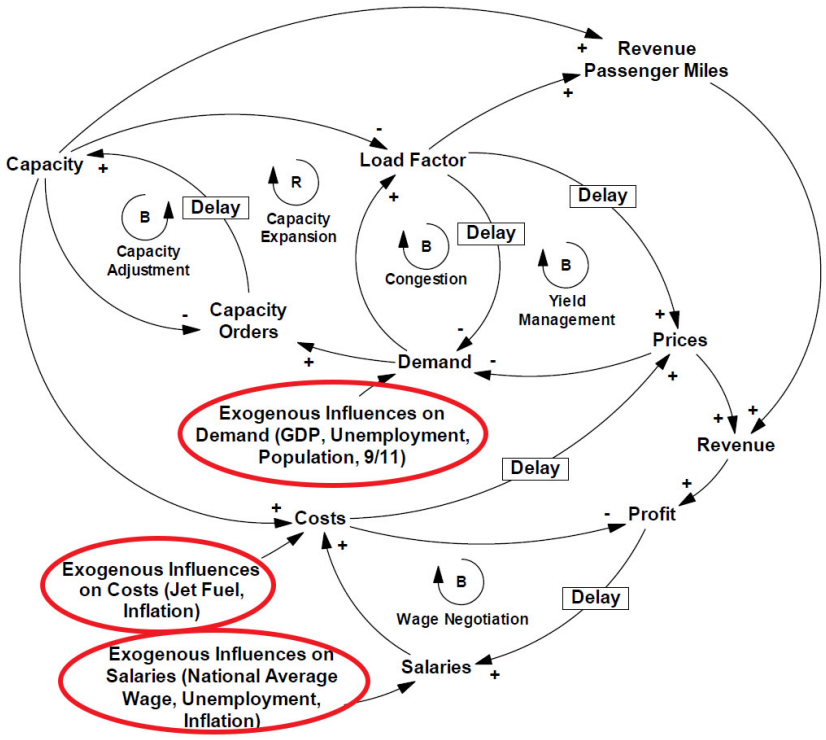

Figure 7 System dynamics model of air transport, by Pierson and Sterman (2013)[3]

The system displayed in Figure 7 contains five **feedback loops**: four negative and one positive. While the positive loop creates a (permanent) growth or decline, the negative feedback loops stabilise the system. Delays in these negative feedback loops create cyclic behaviour. Figure 6 shows this behaviour: it has a growing trend line, while the underlining data line has repetitive (cyclic) patterns. This can help to assess changes.

Change to a stable system

Even with a **stable equilibrium** a system is prone to change via exogenous forces. According to Martin and Sunley (2006), stable systems are also vulnerable for endogenous change: evolution. To better understand how change affects a system, it can help to decompose the different phases of cyclic behaviour. A research area that often applies this type of analysis is ecology. The most basic description of the different phases is made by Holling (1973).

In Figure 8 the most elementary **cycle** of Holling is reproduced. It has four phases:

1. Growth: increasing number of flora or fauna, due to favourable circumstances
2. Conservation: (high) stable number of flora or fauna, due to balance of new and dying entities
3. Collapse: decreasing number of flora or fauna, due to unfavourable circumstances
4. Reorganisation: (low) stable number of flora or fauna, adapt to unfavourable circumstances to make them favourable

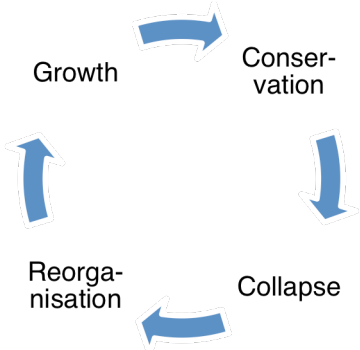

Figure 8 Holling's cycle of ecological systems

These phases occur sequentially, but do not have a prescribed length; often the length is determined by the circumstances. Although endogenous or exogenous events can happen in any phase, from a change perspective the most interesting phase is the reorganisation phase: how the species adapt to the (new) unfavourable circumstances, making them in their advantage.

[3] In model RPK is replaced by RPM (Revenue Passenger-miles), which is interchangeable (with a correction factor in quantitative situations)

Darwin (1859) names two concepts for changes in this phase: variety and selection. While variety is created by small adaptions, selection makes the best variants propagate. Even in a socio-economic system, like air transport, this concept can be adopted: new airlines create the variety, while selection (survival of the fittest) filters the unprofitable airlines out of the system.

Looking at **exogenous** change, Glückler (2007) defines two categories: random change and determined change. Both are, in contradiction with evolution, interdependent from other events. This can be generalised to the difference between exogenous and endogenous changes: endogenous changes are always dependent of previous system behaviour, and therefore are better to predict, while exogenous changes can happen anywhere anytime, especially the random exogenous change.

To see how the system can deal with different types of change, also an analogy with ecology can come into handy. Several authors (Berkes, 2007; Folke et al., 2010; Gunderson & Holling, 2002; Walker, Salt, & Reid, 2012) use the term resilience to describe how much disturbance a system can handle (adsorb) before it changes permanently. As long as the threshold is not reached, disturbance will be temporary, and no permanent changes will affect the system.

Another important notion of Holling (1973) to this resilience thinking is the concept **panarchy**. It assumes there is no single level of cyclic behaviour; cyclic behaviour is omnipresent, from the smallest micro-perspective to the largest macro-perspective, which all can be in different phases at the same moment.

Although this resilience thinking is mostly connected with socio-ecological systems, the concept is also applicable to socio-economic systems like air transport (Bodin & Wiman, 2004).

Concluding a framework about change can be drafted, with two axes: origin and effect of influence (see Table 2). Origin is split between endogenous and exogenous, while effect is split between temporary and permanent. The dividing line between endogenous is depending on the perspective, but in this case all events caused by a stakeholder will be defined as endogenous, and other events exogenous. More important is the splitting point between temporary and permanent. As long as the system can deal with the events without changes, the system is resilient, and the effects are temporary; in all other cases the effects will be permanent.

Important notion to this scheme is the concept panarchy: on different levels (regions or sub systems), the same event (influence) can be in different categories. For example, a new airline route can have positive effects at an airport level (evolution), while this same dynamic can have negative effects at another level. For example, it might require significant adaptation of its network for a home carrier. Or it can have a different impact on different sub systems: the impact of 9/11 on the system was RPK-wise just noise, while the way in which safety is assured in air transport was completely renewed, see IATA (2011).

Table 2 Categories and impact of change

		Effect of influence	
		Temporary	Permanent
Origin of influence	Endogenous	Normal system behaviour	Evolution
	Exogenous	Noise in system behaviour	New system structure

Theoretical perspective of changes in air transport

Research Question 1c: Which theories can help explain changes in air transport?

As stated in Figure 5 on page 11, there are three sub systems of air transport: Technology, Market size & Regulation. To capture all sub systems, theories from three research areas will be used: **Economics, Geopolitical and Spatial development**. It is impossible to link sub systems and research areas directly, as often a research area has interfaces with multiple sub systems.

To illustrate how topics are distributed over the defined research area, in Table 3 an overview is presented of many with the system related keywords. These keywords can be found in the previous section (research question 1a). Each keyword has (had) an endogenous influence on the system.

Table 3 concepts of research question 1a (see Structure of the system) put into a framework of research areas and sub systems

	Technology	Regulation	Market size
Economics	Noise reduction Fuel economy	Open skies agreements	GDP behaviour
Geopolitical	Manufacturers	Chicago convention Deregulation	Colonial territories Globalisation ASA
Spatial development	Range Capacity	Restricted airspace	Intermediacy Centrality HS network

To cover all research areas, four theories are used evolutionary economics, hegemonic stability theory (HST), transport geography and world-system theory. All used theories are chosen due to their cyclic system component, while they all cover a different research areas, with minimum overlap (see Annex B for a more detailed explanation). Only these four theories are used to keep the framework comprehensive and manageable. In the next section each theory will be explained and linked with the system.

Evolutionary economics

The first used theory is evolutionary economics. It is connected to the economics research area, and can be used to describe the "*mechanisms of economic change*", how to deal with innovation, like Metcalfe (1994) states. It assumes cyclic behaviour, like Holling's theory (see page 13). Most renown example of cyclic behaviour in this area are the business cycles of Schumpeter (1939). Limited research is available on cyclic behaviour in air transport, even though according to Jiang and Hansman (2004) it has been a widely noticed behaviour. Liehr, Größler, Klein, and Milling (2001) provide one of the rare studies on this topic, stating this cyclic behaviour is strongly reflected in **GDP behaviour**, while Lyneis (1998) elaborates on the cyclic pattern of aircraft orders.

Witt (2008) has drafted an explanatory framework, in a 2 x 2 matrix, which is shown in Table 4, to categorize different interpretations of evolutionary economics. He uses two differentiating concepts: heuristic strategy and ontological stance.

The heuristic strategy is according to Witt (2008, pp. 548 - 549) "*how they conceptualize "evolution" in the economic context*". The Darwinian worldview is mainly based on natural selection (random effect), while the more naturalistic focuses on regularity (laws of nature).
The ontological stance is the relation between economics and biology. While the dualistic stance "*treats economic and biological evolutionary processes as belonging to different, disconnected, spheres of reality*", the monistic stance assumes "*influences on economic evolution that result from its historical embeddedness in evolution in nature*", as Witt (2008, p. 550) states.

Table 4 interpretations of evolutionary economics (replication of Figure 1 of Witt (2008))

		Ontological stance	
		Monistic	Dualistic
Heuristic strategy	Generalised Darwinian concepts	Universal Darwinism	Neo-Schumpeterians
	Generic concept of evolution	Naturalistic approaches	Schumpeter

According to Witt (2008, pp. 551, 554) independent of the chosen interpretation, often ***recurrent*** patterns are subject of study. The process is more important than the outcome, as it implies "*underlying mechanisms of change*". Outcomes might seem unique, but they are generated in a similar way.
For this problem, the Neo-Schumpeterian approach is most appropriate to use. The Darwinian concepts can help best with the random component of the unexpected exogenous influences, while the endogenous competition can be seen as a variant of the selection of variety. For this system biological effects are not relevant: it is not the core of socio-economic systems. This is the case at the dualistic ontological stance.

Universal Darwinism: Selection of variation (of species), heredity of characteristics (Darwin, 1859)

Schumpeter: Creative destruction, business cycles (Schumpeter, 1939)

Neo-Schumpeterians: Innovation economics (Nelson & Winter, 1982)

Naturalistic approaches: Novelty emergence, dissemination (Veblen, Georgescu- Roegen, Hayek, North)

Figure 9 Keywords of the evolutionary theories

When using the **Neo-Schumpeterian** perspective of evolutionary economics, the concept of path-dependency comes up - or in a more strict formulation lock-in effect (see Arthur (1994)) - to describe sequential behaviour dependent of previous choices. Historic choices still have impact on the current system, and change is not easy.

Concluding evolutionary economics are useful to explain the incremental developments of the system. For this cyclic behaviour is an important concept, with feedback loops. Combined with the path-dependency, it can be amplifying the behaviour of the system: positive effects can be multiplied, while negative influences can create a downward spiral effect. But due to the size (lock-in) of the system, it is foremost expected to have a stable equilibrium.

In this case, without exogenous constraints, an airline could grow infinite: a profitable airline can buy more aircraft, transporting more passengers, making more profit, etcetera, pushing away competition. This makes market entrance of other airlines hard. But when they succeed – with for instance significant government support – they can turn the feedback loop for incumbent carriers around: making losses leads to budget cuts, until there is nothing left.

Hegemonic Stability Theory

Hegemonic stability theory (HST) is a theory linked with geopolitics. According to Snidal (1985) HST describes the successes and failures of international cooperation is organised. It assumes a dominant state with a leading role. Without this (dominant) leading country (economic), according to Kindleberger (1986), chaos will emerge, like the Great Depression. Originally the hegemon used to be a trade leader, for instance the Netherlands in the 17th century, but over time this definition broadened, as the current hegemon, the United States, also is the hegemon in political and military aspects.

The role of hegemon is taken by turns. According to Gilpin (1983) this can happen when the growth rate of the hegemon falls behind, as it makes financing its dominance more difficult. This change of hegemons follows also a cyclic pattern, as Arrighi (2002) notice, when a hegemon is often changed in periods of recession (or war, as in previous centuries).

In air transport, the United States is leading since the early days of aviation, on all aspects: technology, market size and regulations. Many aircraft manufacturers, nowadays integrated in Boeing, are located in the United States. Boeing is (together with Airbus) the most important aircraft supplier. Its domestic market is the largest air transport market,

and many American airlines are in the top 10 of largest airlines worldwide. And the Federal Aviation Administration is one of most important air transport regulators in the world. The liberalization of air transport started in the US, but international expansion emerged slowly due to "a double coincidence of interests", as Button (2009) writes. The first closed 'open' ASA was in 1992 with the Netherlands, and since than more than 60 countries have followed.
The last decade air transport the USA is suffering more and more competition from abroad, mostly Europe, as air transport in Asia is still in its infancy.

Transport geography

From a spatial perspective, air transport can be analysed with transport geography. It can be used to explain how transportation is distributed worldwide, which is especially the case for airports and airlines. Whereas the other used theories are more top-down, transport geography is structured bottom-up, building a network of nodes and connections.

Transport geography is a specialization in economic geography, which researches the spatial development of economics. It deals with the emergence of "*geographical clusters, global cities, international production systems and globalization*" as Glückler (2007) summarizes, which is closely connected with the growth of air transport. It does not prescribe why certain areas are less or more developed, as it is "*a combination of chance (small, arbitrary events) and necessity (through the build-up of agglomeration economies)*" which determined the special development according to Boschma and Lambooy (1999). They also argue these factors together with 'the winner-takes-it-all' principle led to **economic leading regions**. The competitive advantage makes it possible for regions to deal with developments, "*when their institutional and knowledge parameters match the needs of these new events*".

Important for the use of transport geography in this research is that all flag-carriers make use of a hub-spoke (HS) strategy. While point-to-point traffic offers less route flexibility, travelling via a hub makes different routes possible. The transferring hub is less important to the passengers, as long as their total travel time is not significantly longer. Therefore the location of the hub is less important (due to the high cruise speed of an aircraft, a few hundred kilometres extra is just a couple of dozen minutes extra), but the connection time at the ground is. Like Dennis (1994) visionary stated, when Emirates had just a dozen of aircrafts and other Gulf carriers were non-existent, "*travellers could interchange in the middle of the desert if there was a convenient hub available servicing their market*". In practice often airlines try to locate their hubs near major cities, with high local demand for air transport, according to Dennis (1994) to capture premium (high-yield) traffic – direct passengers or cargo. Leftover capacity will be filled-up with transferring passengers at minimum costs. This inexpensive air transport, together with the low fares of LCCs, was according to Rodrigue et al. (2013) an impetus to the growth of tourism.

The location of airport **hubs** depends according to Fleming and Hayuth (1994) on two elements: **centrality** and **intermediacy**. Centrality is the relative location to destinations in the proximity of the airport, like major cities, tourism hotspots or industrial areas, whereas intermediacy is the relative location to other airports, so it can act as an intermediate en-route stop with minimal additional flying times and costs. Dennis (1994) adds the minimal connection time, which is partly related to congestion and weather-related delays (also affecting the reliability of the hub).
The Gulf carriers make cleverly use of their intermediacy advantage. Without being cost-leader, they can offer affordable air transport between mainly Western Europe, Eastern Africa and South–Asia/Pacific. Their strategy focuses on comfort and service, although they also suffer congestion at their hubs due to their enormous expansion.

World-system theory

As announced the final theory will be the world systems theory, of Chase-Dunn and Grimes (1995). This theory is more general than the three before mentioned (Evolutionary economics, HST and Transport geography); world-systems theory combines economic, political, social and cultural aspects into an integral system – the world-system.

World-system theory can be used to explain the mismatch between country size/population and the size of its airline(s). For instance why is there no Indian or Indonesian airline in the top 25 of largest airlines in the world, while the countries are ranked among the largest in the world? And why are there, on the other hand, small countries with disproportional airlines, like the United Arab Emirates, Singapore, Hong Kong and the Netherlands.

One of their most important structures of world-system theory is "*a power hierarchy between core and periphery in which powerful and wealthy 'core' societies dominate and exploit weak and poor "peripheral" societies*" (Chase-Dunn

& Grimes, 1995, p. 389).The main reason for this division is labour-related: core countries need to 'exploit' peripheral countries to maintain their position. The division is based upon qualitative and quantitative parameters, which is described by Terlouw (1992). Important is the role of the semi-periphery: they are used to take out anger of peripheral countries, while they have favourable (cheap) labour and investment conditions. Semi-peripheral countries can become core countries, but can also drop to the periphery.

Most interesting element of the world-system theory is the categorisation of countries, in core, semi-periphery and periphery. Legacy carriers can be seen as a part of the core, while the Gulf carriers are in the semi-periphery. It is possible to change category, but more interesting is the role of the semi-periphery to protect the core against the periphery. The Gulf carriers can for instance keep airlines from Africa small, allowing legacy carriers to operate profitable routes to this region.

Conclusions

This chapter has explored the three main sub systems of the air transport system, technology, market size and regulation, and has connected this with the research areas economics, geopolitics and spatial development. Afterwards a structure for influence and change was presented. To cover these research areas, four theories are used: evolutionary economics, hegemonic stability theory (HST), transport geography and world-system theory. These theories help to build a framework to understand the dynamics of this system.

The three sub systems of air transport, combined with the categorisation of influences and (see Table 2 on page 14), and with the presented theories leads to the framework of Table 5.

Table 5 Change types split per sub system

	Air transport system		
	Technology	Market Size	Regulation
Temporary – endogenous	System behaviour (selection of variety)		
Temporary – exogenous	Disturbances		
Permanent – endogenous	Innovation	Change of intermediacy & semi-periphery	New agreement types
Permanent - exogenous	Inventions	GDP-development	Hegemon change

The framework of Table 5 can be used to assess the systemic changes of the air transport system, caused the Gulf carriers. By comparing characteristics of the Gulf carriers with the presented keywords, the influence and changes can be determined. When applying this framework to the Gulf carriers, for each sub system a different category can be found most applicable.

From a technological perspective, the Gulf carriers are not revolutionary. As endogenous influence to the system, they operate like legacy carriers, though parts of their operations are innovative. They focus on volume, especially Emirates, while they try to pamper passengers with premium service and entertainment. Due to the variety in service in the current market, it is unlikely this will be a game changer to the system. In this sub system, their effect will likely be temporary, so from a technological perspective the trend of the Gulf carriers will be normal system behaviour.

Regarding the market size, the Gulf carriers profit from their geographical strategic location between the old and new world. Especially to and in the new world air transport is growing rapidly, due to the high GDP growth. Taking this into account, it can be said that the Gulf carriers have their hub in the sweet spot. However their new intermediacy hub does not automatically imply legacy hubs are shut down. To that extend, it is too early to speak about a change of intermediacy and periphery – at most they create a new hub and extend the semi-periphery. This implies also no permanent change, and also from a market size perspective the Gulf carriers can be seen as system behaviour.

The last sub system on regulation is also not revolutionary for the Gulf carriers. ICAO and IATA rules and regulation, established in the old world, still dominate the air traffic industry. The Gulf carriers do not noticeably influence or change these rules and regulations, although attempts are made to attract governing bodies to the region, for instance by hosting conferences. But as no serious moves are imminent, it is unlikely permanent changes will occur to the sub system. Therefore also in this sub system the Gulf carriers can be assessed as system behaviour.

3

The value of KLM for the Netherlands

After developing a framework how to assess systemic changes to air transport, this chapter will deal with the Dutch situation. Therefore a focus to KLM and Schiphol is made, as these stakeholders are prone to the business of the Gulf carriers. Other carriers are no or limited exposure to the Gulf carriers business, as they operate in different markets (short-haul or leisure point-to-point traffic). The same applies to airports; Schiphol is the only airport with long-haul flights in the Netherlands.

First step of assessing the value of KLM to the Netherlands is to unravel "*How are air transport and regional economies connected?*". The results of this research question help to focus in research question b and c. Research question b "*How much does Schiphol dependent on KLM's operations?*" will explore the Schiphol's dependencies of KLM. The last research question "*What will happen to an airport when a home-carrier ceases its hub-operations?*" is a hypothetical specification of the previous research question, elaborating on de- and re-hubbing. Together these research questions can answer the sub question "**What is the value of KLM to Dutch society?**".

National interest of air transport

Research question 2a: How are air transport and regional economies connected?

Air transport is beneficial for regional economies. It generates employment and revenue at airports and airlines, supporting industries and (indirectly) stimulates tourism, business and trade. The benefits can be divided in **direct benefits, indirect benefits and catalytic benefits**. The first category of direct benefits is most straightforward, and contains all employment and revenue generated by airlines and airports.
Airports and airlines operate their business, and pay salaries to their employees, each of these groups will need supplies. This spending will generate indirect benefits, composed of all supply chain revenues and all spent wages of employees.
The last group, catalytic benefits, might be the largest but also hardest to define category. Air transport has an enabling effect on local economies: cheaper transportation will attract tourists, business and trade. Without (cheap) air transport, some would still come, but many others would not. For tourism this still can be estimated with elasticity figures, but business and trade it is extremely difficult, as it is harder to see as a mass.

The precise effects are hard to enumerate. Although the direct effects are often easily quantifiable, the indirect and catalytic effects are not. Often these effects are ill defined: every research has different boundaries, and so other figures. Thence it is hard to compare different airports and countries. But using a single research (method) for multiple, as in Annex E, it is possible to compare countries on an abstract level. It gives an order of magnitude, illustrating the importance of air transport for a nation. With direct effects of billions and more, and even high indirect and catalytic effects, it is easy to understand why air transport is often seen as a matter of national interest. It is not only national prestige that keeps governments in favour with their national airlines and/or airports. The economic dependencies are often the reason for commitment and (monetary) subsidies by the public administration, despite the unknown exact effects.

To illustrate how these benefits differ per country, in Annex E an overview is presented of many first and second world countries and the benefits of air transport per category. For example, the benefits of air transport in 2013 for the Netherlands is approximately 11.8 billion (5.4 billion direct, 3.5 billion indirect and 2.8 billion employees spending), which is 2.1% of the total GDP. There is also an induced effect of 5.8 billion. For the United Arab Emirates these numbers are 12.9 billion total (7.4 billion direct, 3.1 billion indirect and 2.5 billion employees spending), which is 6.2% of the total GDP, and an induced effect of 17.8 billion.

But the absolute numbers and ratios of the effects differ a lot. For instance Iceland has the highest GDP contribution percentage wise, while the absolute value is low compared to other countries (660 million). The USA has the highest GDP contribution, almost 391 billion, but the induced effect is less than half (129 billion).

There can be multiple reasons why these ratios differ so much. As Doganis (2009) explains, in some countries domestic flying is more common, due to large distances or a lack of roads, for instance in the USA. Other countries try to create transfer hubs, or attract tourists with good connections by air (Lohmann et al., 2009). This variance of roles of air transport in society makes it impossible to judge the connectedness of air transport and regional economics merely on numbers. Therefore it is required to look at the underlying structure in more detail.

System dynamic model of air transport

To get a better understanding of how air transport is connected to local economies, it might be better to observe the system from a conceptual perspective, to make a distinction between different categories of contribution.

Tam and Hansman (2002) provide a **conceptual model** of the relationship between the air transportation system and the economy, which is included in Figure 10. Besides the direct links between the economy and airlines, an important intermediary is present: an entity providing the interface between supply and demand. The virtual connection between supply and demand mainly takes place at travel agencies or online. But the actual physical connection is at an airport, when passengers board an aircraft. Therefore, to simplify this model, to a more tangible form, Figure 11 is drafted. It shows how any airline contributes to regional economies of the airports they serve, directly and indirectly via airports.

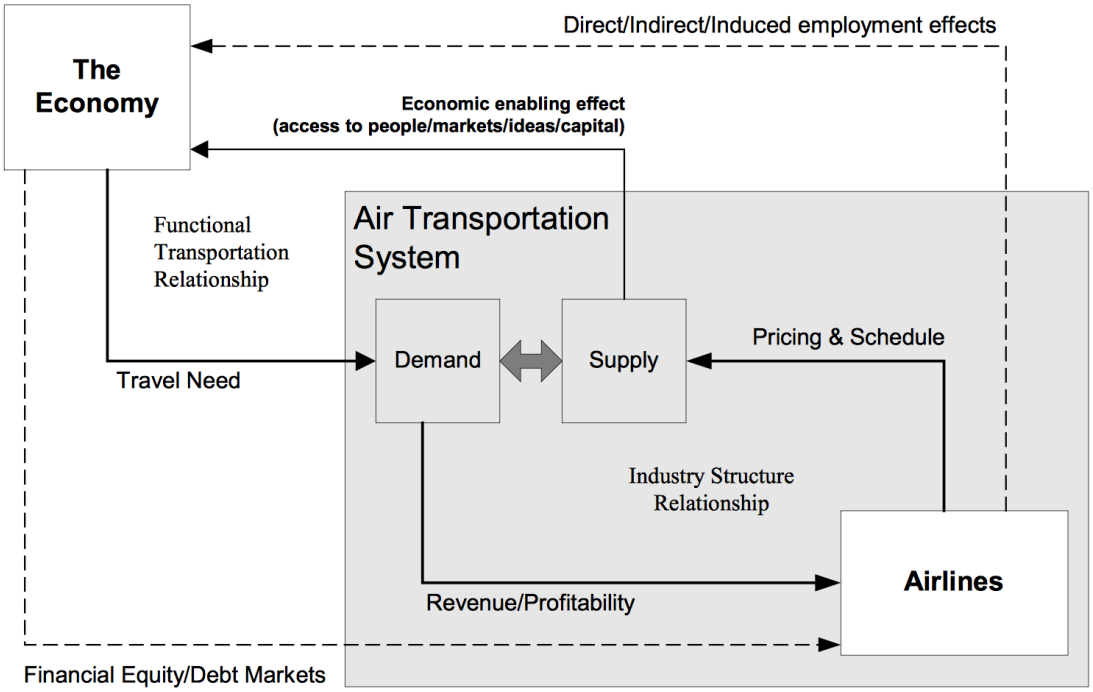

Figure 10 Relationships between economy and air transport (Tam & Hansman, 2002)

Observing the model, there is a **positive feedback loop**: When an airline brings more traffic (tourists, businessmen and/or goods) to an airport, more staff will be required to handle the traffic, while the traffic itself also will generate extra spending, raising the local GDP. The raised GDP can make it more attractive to come to the region for business or tourism, increasing the demand for passenger seats and/or traffic. The increased demand will make it more attractive for airlines to schedule more aircraft volume (increased frequency or larger aircrafts) to the airport, or even new airlines will start to serve the airport, which completes the loop.

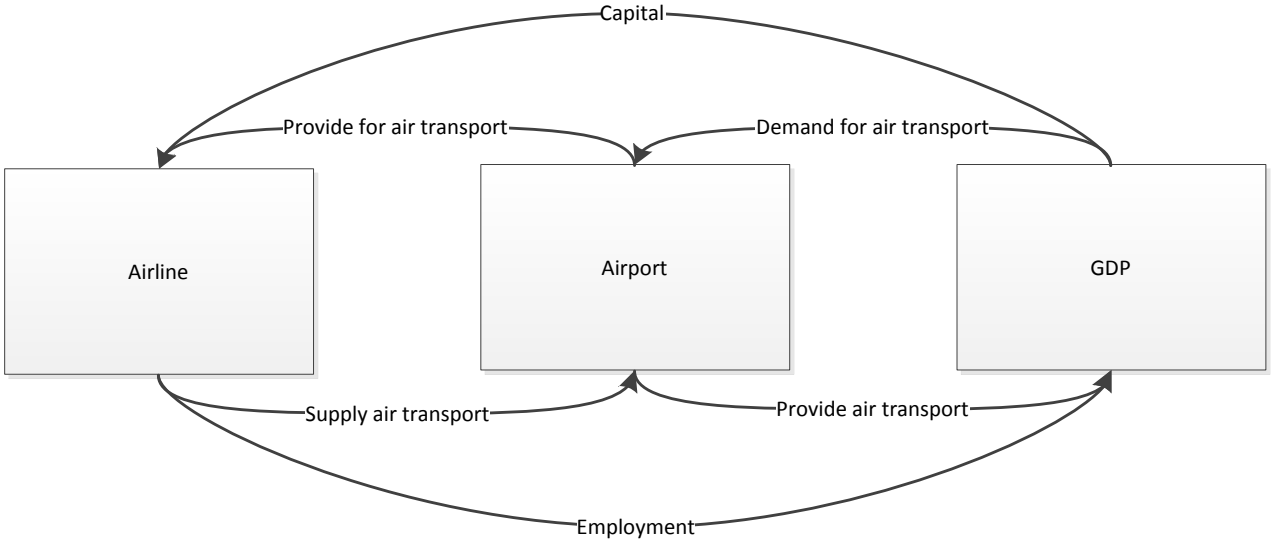

Figure 11 Relation between airline, airport & economies (GDP). Source: own work.

Different types of Full Service carriers

The concept of HS-network creates two types of FSCs at airports, besides LCC's and holiday charters: airlines with a hub at an airport, and airlines using the airport as a spoke-destination. Airlines with a hub at an airport – **hub airlines** – will likely contribute more to regional economies: their operations are likely larger at the airport, and they will have a head quarter and/or supporting staff in the vicinity of their hub. But their traffic is mainly transferring, which can benefit by spending while waiting at the airport, but does not generate spending during a longer stay.
In contrast, airlines using the airport, as a spoke-destination – **inbound airlines** – requires limited staff at or near the airport. But their passengers are likely to stay longer than transfer passengers, as most have the airport as their origin or destination.

Many airports have a mix of all types of airlines. All primary airports have at least one hub-airline, but also other types, up to LCC's. This mix, and the fact that it is not possible to provide a statement which airline relatively contributes more to the GDP, as it might differ per case, makes it hard to assign an importance to each category. Still, many primary airports rely on their hub airline, as they provide a larger volume than inbound airlines.

Concluding looking merely at the numbers does not show how air transport is connected to regional economies. When looking at the underlying structure, airlines contribute to regional economies of the airports they serve directly and indirectly. The majority of the effects is indirect, via the airport served. Direct effect are mostly exclusive to home carriers. Also a distinction can be made between the different types of airlines. For instance a LCC has presumably a higher rate of O/D-passengers, but maybe the nature of their visit (leisure instead of business) induces less spending at the destination.

Schiphol's dependency of KLM

Research question 2b: How much does Schiphol dependent on KLM's operations?

Schiphol is one of the most important long-haul airports in Western Europe. According to Dennis (2007) 60% of all European long-haul traffic is concentrated in four major hubs: London Heathrow, Paris CDG, Frankfurt and Amsterdam. But many other airliners, from short-haul FSCs to holiday LCCs, also service Schiphol. It is home to four airlines: one hub FSC (KLM) and three LCCs (Arke, Corendon Dutch Airlines and transavia.com), mainly servicing holiday destinations.

Market shares at Schiphol

In total over 70 passenger airlines service Schiphol. The variety of performance indicators for airlines, as listed in Annex D, can also be applied for performance at an individual airport. Volumes can be measured in absolute numbers, like passenger or frequencies, but as a short-haul flight with a small aircraft has a complete other impact than a large aircraft flying a long-haul flight, often Available Seat Kilometres (ASK) is used as a fairer yardstick. It embeds distance, which is correlated with time and importance of travel.

Table 6 Top 10 of airlines market share at Schiphol, w/c 3 Nov 14

Code*	Airline	Frequency share	Capacity (ASK) share	Number of routes
KL	KLM-Royal Dutch Airlines	50.4%	56.2%	132
DL	Delta Air Lines	4.4%	10.0%	9
HV	transavia.com	4.0%	2.9%	32
UA	United Airlines	1.1%	2.7%	4
OR	Arke	0.7%	1.9%	10
EK	Emirates	1.0%	1.8%	1
CZ	China Southern Airlines	0.6%	1.8%	2
U2	easyJet	7.9%	1.5%	20
SQ	Singapore Airlines	0.4%	1.5%	1
MH	Malaysia Airlines	0.4%	1.5%	1

*** IATA airline codes, see http://en.wikipedia.org/wiki/List_of_airline_codes**

When looking at the numbers (Table 6), KLM is the largest airline at Schiphol, with more than 50% of all flights, and even larger share of the total ASK originating from Schiphol. Second is Delta Air Lines, the American partner of KLM (in the Sky Team alliance). Due to the longer flights to the USA (and India), it has a share of 10% in the total ASK from Schiphol, with only 9 routes. Third is KLMs low-cost subsidiary transavia.com, still responsible for over 130 flights per week. Other remarkable airlines:

- Arke (4th), another Dutch low-cost airline with (intercontinental) holiday destinations
- Emirates (6th), largest gulf carrier at Schiphol
- easyJet (8th), low-cost airline from the United Kingdom, without aircrafts based (although they will do this in the near future) at Schiphol second to KLM in weekly flights.
- The last home carrier, Corendon Dutch Airlines, is listed at the 15th spot. Etihad airways can be found at the 18th place.
- Qatar does not service Schiphol yet (service commences in June 2015)

See full table and used assumptions in Annex F.

KLM's feeding countries

Zooming in on the largest airline, not coincidentally the hub carrier KLM, most of its passengers are transfer passengers (67% according to (Cornelisse, 2014)) to operate its network. As an airline with a small hinterland, it is relying heavily on feeder flights with transfer passengers, more than the other major hubs. To see where KLM finds most transfer passengers, in Table 7 the top 10 countries, which KLM serves, based on seats per week, is listed.

Except for the US, all countries in the top 10 are European countries, served with small aircrafts with high frequencies, up to 12 daily for some destinations. This high frequency is to allow passengers from these feeder flights to connect to intercontinental flights with minimum waiting time. These feeder flights generate a relatively low ASK, but a high number of seats per week and frequency. Most important are countries are the United Kingdom (GB, 1st), Germany (DE, 2nd) and Norway (NO, 3rd), together accountable for almost 30% of all KLM seats per week. Passengers originating from or destining to these countries are used as feed for long haul flights, mostly US-bound flights. Italy (IT, 4th) and France (FR, 6th) are the home countries of KLM's partner airlines Alitalia and Air France, also feeding KLM and vice versa. The United Arab Emirates is at the 20th position (see Annex F for the full table), while Qatar is at 51 (total number of countries is 62).

Table 7 Top 10 of destination country distribution of KLM from Schiphol, w/c 3 Nov 14

Country*	Number of Destinations	Seats per week	% country total	Frequency per week	% of ASK
GB	13	43280	13.81%	387	2.00%
DE	10	29168	9.31%	290	1.17%
NO	9	20668	6.59%	175	3.03%
IT	6	15904	5.07%	126	1.46%
US	7	14348	4.58%	53	9.27%
FR	5	13332	4.25%	111	0.90%
CH	3	11862	3.78%	97	0.69%
DK	3	11680	3.73%	97	0.61%
ES	3	11158	3.56%	77	1.36%
SE	3	9440	3.01%	76	0.86%

*** ISO 3166-1 alpha-2 codes, see http://en.wikipedia.org/wiki/ISO_3166-1_alpha-2**

The high rate of transfer passengers is a costly undertaking. The additional flight to the hub incurs extra costs, while the ticket revenues are often lower, due to the high price elasticity and competition. Together with relatively high labour costs due to old agreements (see De Wit, 2014), this creates an extra vulnerable position for KLM.

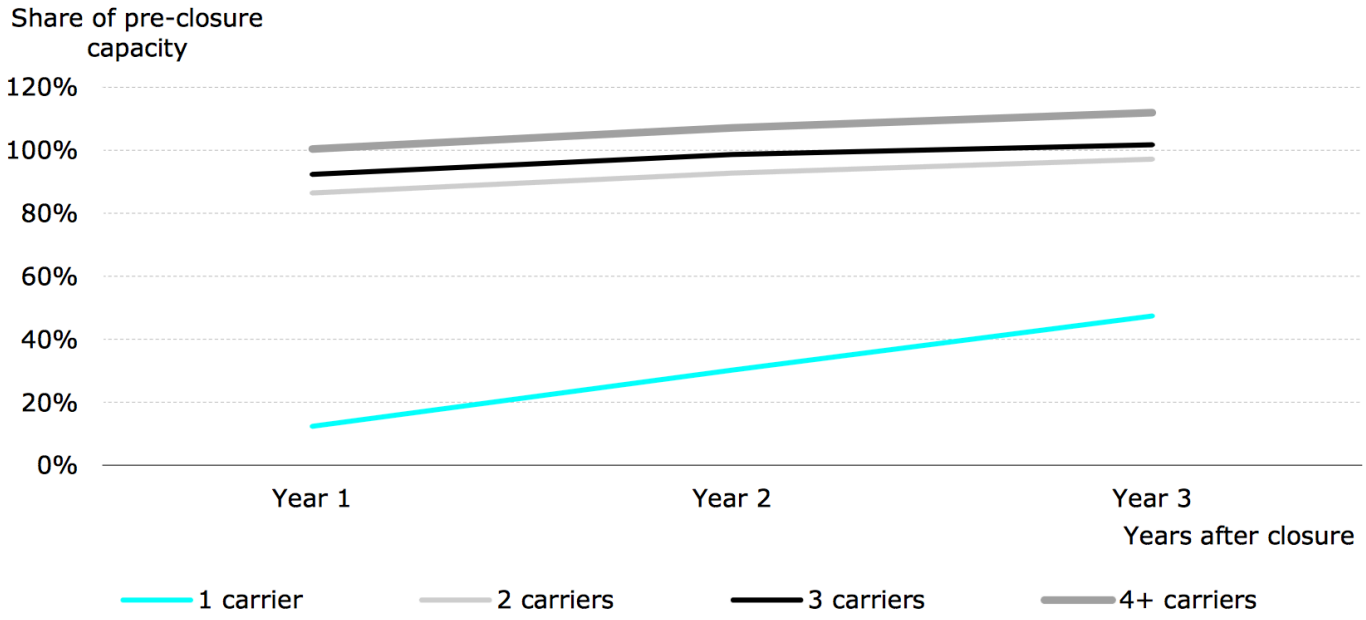

Figure 12 Route capacity after closure of a route by an airline, divided upon number of carriers on route (Thelle, Pedersen, & Harhoff, 2012)

Route competition at Schiphol

To see how important KLM is for Schiphol's destination portfolio, it is necessary to elaborate on the competition on the routes to destinations. As Figure 12 shows, is the impact of the closure of a route by an airline is limited when there is competition; however when an airline discards a unique route, this is devastating for the capacity.
In Table 8 is listed how many competitors KLM has on its 132 routes, from no competitors on more than half to three competitors to Dubai, Lisbon and Rome. Other carriers only fly 98 routes without competition of KLM.

Table 8 Number of competitors per route for KLM from Schiphol, w/c 3 Nov 14

No. of competitors	Destinations	%
0	71	30.9%
1	46	20.0%
2	12	5.2%
3	3	1.3%
No KLM	98	42.6%
Total	**230**	**100.0%**

As shown, KLM is responsible for more than half of the volume at Schiphol, with routes with high frequencies to neighbouring countries. The high frequencies are the result of the transferring passengers, but the early morning flights are also attracting premium passengers. Looking at the destination's portfolio, KLM is the only carrier on almost one third of the routes.

Although it seems straightforward to conclude KLM's value is what Schiphol will miss in volume and routes when KLM defaults, this seams is to easy. To elaborate more on this, the next research question will focus on de- and re-hubbing.

De-/Re-hubbing of an airport

Research question 2c: What will happen to an airport when a home-carrier ceases its hub-operations?

Although it is a rare event, several European hub carriers defaulted. In the wake of 9/11 Swissair and its Belgium subsidiary Sabena ceased operations. And in 2012 the Hungarian FSC Malev went bankrupt. Swissair is restarted as Swiss International Air Lines with the help of the Swiss government. A part of Sabena is restarted as SN Brussels Airlines, although its strategy looks more like a LCC strategy. Malev disappeared from the air transport world. This (partial) loss of a hub carrier is according to (Bhadra, 2009) known as "de-hubbing". "Re-hubbing" is also possible: a recovery of the HS-network by an (other/restart) airline.

Re-hubbing: three European examples

When observing the passenger data from Schiphol Airport (AMS), Brussels Airport (BRU, former hub airport for Sabena) and Zurich Airport (ZRH, former hub for Swissair), the traces of the collapse are clearly visible (see Table 9). 2001, the year of the 9/11 attacks and the cease of operations, both airports suffered severely. Schiphol was also hurt by the attacks, but still grew. The year after, Schiphol had a growth of its passenger numbers, but both Brussels and Zurich lost a significant part of their traffic. Nowadays Zurich has recovered to their pre-collapse passenger number, but Brussels still has not recovered. Maybe this is the result of the re-hubbing differences between both airports: Brussels airlines focuses on point-to-point passengers, while Swiss re-implemented a HS-network, transferring passengers in a central hub.

Table 9 Comparison of passenger numbers of Amsterdam, Brussels and Zurich airport (AMS data: Schiphol Group (2014), BRU data: Brussels Airport (2014), ZRH data: Flughafen Zürich AG (2014))

	Δ% 2000-2001	Δ% 2001-2002	Δ% 2000-2013	%transfer (2013)	Share largest airline (2013)	Largest airline
AMS	0.1%	3.3%	33.8%	41.8%	66.9%	KLM incl. code share
BRU	-9.0%	-26.8%	-11.6%	15.0%	30.8%	Brussels airline
ZRH	-7.5%	-14.8%	9.7%	32.8%	56.8%	Swiss International Air Lines

In Figure 13 the percentage transfer passengers is plotted for the last twenty years. In this case one could say the airport is re-hubbed, although the number of transfer passengers is 2/3 of what it used to be just before the collapse.

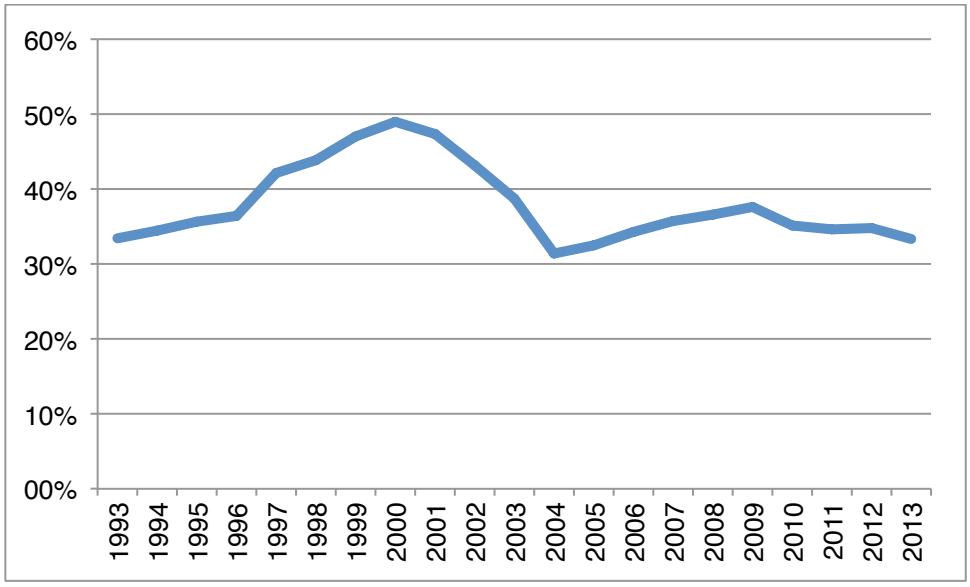

Figure 13 Percentage transfer passengers at Zürich Airport

Looking at Budapest Airport is even more remarkable. In Figure 14 the year of the collapse is compared with the year before. Clearly visible is the collapse in February. Remarkable is the recovery: although the numbers of 2011 are not reached, the loss in minimal. This is the result of many other airlines filling the gaps Malev left (which was approximately 40% of the total passenger number), especially Ryanair, which opened a base at Budapest Airport weeks after the bankruptcy. (Airport Business, 2012)

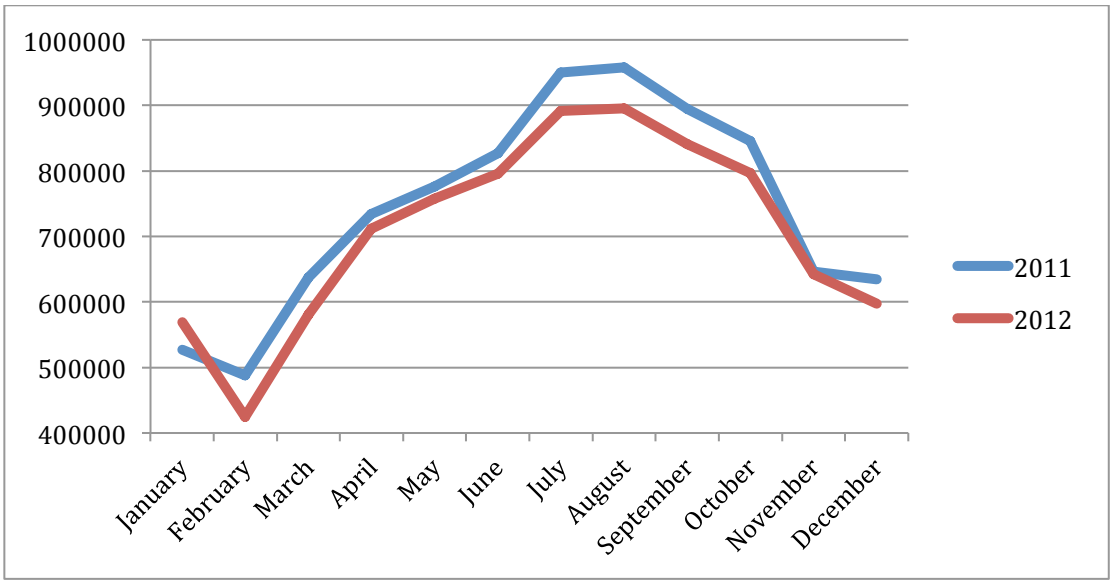

Figure 14 Passenger data per month of Budapest Airport (Budapest Airport, 2014)

Based on the figure it is tempting to state Budapest airport has not suffered after the loss of Malev. Passengers' numbers did not drop, which suggest equal revenue for the airport. But the replacement of a FSC by LCC can have implications to the national welfare. Where FSCs serve a mix of destinations, both short-haul as long haul, LCCs focus more on short-haul leisure destinations.

Re- and de-hubbing theory

To make a distinction in the different types of de-hubbing, Redondi, Malighetti, and Paleari (2012) has drafted four categories, based on the seats offered after five years:

- "Alliance-dominated": more than half of the seats are offered by an airline alliance
- "Low cost-dominated": more than half of the seats is offered by LCCs
- "Unallied-dominated": more than half of the seats are offered by unallied carriers
- "Battleground": there is no dominant carrier group

The welfare effects of recovery type are not researched. When long-haul destinations are important, an alliance-dominated strategy will be best, as it is the closest representation of a hub-airline. For Schiphol this scenario can unfold with KLM's Sky Team alliance partners. Many of them nowadays serve Schiphol, making use of KLM's feeder flights, or connecting to other long-haul flights, of KLM or partners. Without KLM this network could be maintained, although slimmed down due to the disappearance of KLM.

In the examples of this research, two airports are re-hubbed with a new airline (restart of defaulted airline with government support), while Budapest is Low cost-dominated. In passenger volumes both are successful, especially the last, but the difference in network quality is not researched due to lack of data.

Political vision on the role of an airport

As in the conceptual model in Annex B showed, the political vision on an airport is not purely economic. On one side, the Dutch government recognizes the importance of a strong airport and destinations network (see quote on page 4). However in their policies this importance is not reflected, as in the interviews with stakeholders and researchers came up impartiality is more important. This creates a dilemma, as this indecisiveness makes it impossible to state clear what the impact of each re- or de-hubbing strategy will be for Dutch society.

Summarizing can be said losing a hub airline is not the end of an airport. There are multiple degradation scenarios, but it is hard to say which is best for the local economies. Short-term traffic loss can be taken over by other carriers, as illustrated at Budapest airport, and on the longer term at Brussels and Zurich airport.

As showed for Zurich airport, the transfer passenger rate does not return to its pre-crash level. This can implying the size of the hub airline's network is significantly smaller. A smaller HS-network has less (intercontinental) destinations. If connectivity is goal, it is best to re-hub or to stimulate an alliance-dominated de-hubbing strategy. Although as shown it will not re-establish to a pre-crash level, it still is possible to operate a HS-network.

Conclusions

KLM contributes to the Dutch society in multiple ways. Directly it is one of the largest private employers, with 26500 employees (Cornelisse, 2014). But is also contributes via the airports it serves, especially their hub Schiphol. The magnitude of this impact is harder to assess, as it has multiple types of benefits. Indirectly it requires suppliers: airport staff, caterers, handlers, maintenance, and so on. It also acts as a catalyst, for business – attracting foreign multinationals and/or distribution centres, and offers local companies to travel easy and cheap abroad - and tourists to and from the Netherlands.

Looking at the numbers of KLM at Schiphol, it KLM is accountable for more than half of the traffic, both in number of flights as in available seat kilometres. The majority of the flights is to neighbouring countries. Long-haul flights often depart once a day; to provide minimum waiting times many feeder flights are required. Countries, which are mainly used for feeding KLM's network, are the United Kingdom, Germany and Norway. Unfortunately one cannot say this is the Schiphol's dependency of KLM, as the possible gap of KLM's disappearance is likely (partly) to be fulfilled by other airlines.

De- and re-hubbing theory shows the effect of a ceasing airline at an airport are volume wise limited. However the number of destinations is likely affected. For Schiphol the volume the most performance indicator to remain operating profitable, while for society the number of destinations is likely more important.

4

Landscape changes by the Gulf carriers

In the previous chapters is shown how Schiphol could be affected by a disappearance of KLM. However it also shows how a replacing airline can limit this loss. This chapter will explore how the Gulf carriers can play a role in both aspects: the disappearance of KLM by growth of the Gulf carriers, and the positive effect of the Gulf carriers to Schiphol and the Netherlands.

Three airlines - extremely expanding - are often referred to as **Gulf carriers**: Emirates (EK) of Dubai, Etihad Airways (EY) of Abu Dhabi and Qatar Airways of Doha (QR). Whereas airports in the Gulf region used to be serviced as refuelling stops or as outposts by European airlines, they are nowadays hubs of large airlines. (Hooper, Walker, Moore, & Al Zubaidi, 2011)

Emirates is the oldest of the three (see also Annex C). It started almost 30 years ago, after leaving Gulf Aviation – an airline owned by multiple Gulf countries. In the early years Emirates was a small, insignificant airline, but it growth strategy has resulted in becoming one of the largest airlines in the world (see Mouawad, 2014). Emirates has been very successful, making profit for many years, even in bad times. (O'Connell, 2011) Its success is also visible in the growth for Dubai airport, with plans to accommodate 200 million passengers per year, more than twice the passenger number of the current largest airport. (Dubai Airports, 2014)

In its slipstream the two other airlines were established. Its profitability is unknown, as only Emirates published annual reports. But even without being profitable, these airlines can be very beneficial to their home countries, as Negroni (2011) states, by bringing in business, trade and tourism (like Singapore achieved with Singapore Airlines, see (Lohmann et al., 2009)). Others, like Vespermann et al. (2008) see the Gulf carriers as the future for the Gulf countries, when they cannot earn money with petroleum anymore.

Legacy carriers feel the threat of the Gulf carriers. They argue they have unfair advantages, creating an unfair playing field, dooming incumbent air transport. Some countries as a response introduced protectionism policies, some leading to political dispute (Jones, 2011). These developments and other characteristics of the Gulf carriers are evaluated, to answer the first research question "*How did the air transport playing field with the Gulf carriers develop to its current situation*?".

Thereafter these developments will be extrapolated to the future, to answer the research question "*Which scenario presents a possible future for the Gulf carriers, based on the current playing field?*". The scenarios will be used to sketch the boundaries of the Gulf carriers, to assess their future role, and its impact to the Netherlands.

Together theses research questions help to answer the last sub question "***Which future scenario is most likely for each Gulf carrier?***".

Developments of the playing field with the Gulf carriers

Research question 3a: How did the air transport playing field with the Gulf carriers develop to its current situation?

Incumbent carriers, Lufthansa in particular, complain about an unlevel playing field: the Gulf countries would use government funds to support losses of the airlines, to push competition of the market. (Bryant, 2014; Drew & Mouawad, 2014; "'Europa pleegt zelfmoord'," 2013; Heide, 2005; Stil, 2011; Voogt, 2013) Proof for this practice is limited; all Gulf carriers are government-owned, and annual reports not always available, and do not include state-aid reports. The Gulf carriers deny the state-aid, or provide as a counter argument the incumbent airlines also receive(d) state aid. Many researchers dealt with this issue, but no one provides hard evidence for an unlevel playing field. Some advantages for the Gulf carriers are transparent, like the geographical advantage (located half-way between Europe, Africa and Asia), the favourable tax conditions (the airlines are exempted from many taxes (Vespermann et al., 2008)) and the relaxed regulations (no curfews at the hub airports, also due to very close connections between airline, airport and regulator). Additional complexity is added by the fact the two most important aircraft manufacturers are in Europe and the United States, which both **generate employment** (Boeing is the largest exporter of the United States, and Airbus has production sites in many European countries, like France, Germany and Spain). To stimulate the export of aircraft, many countries offer export credits. For instance Emirates has used this (cheaper way of finance for 18 of its current (August 2014) 50 A380s (Bonnassies, 2014). While a proponent argues export credits are beneficial for employment in Europe, opponents argue in this case it is like digging their own grave, as it will lead to extra competition for incumbent airlines (Drew & Mouawad, 2014).

Turkish airlines

Sometimes Turkish Airlines (TK) is also considered to be one of the Gulf carriers. It has similar advantages, like a strategic geographical location and a cost-base lower than incumbent airlines. In this research TK will be left outside, as other characteristics make it different than the Gulf carriers. It is located ±2500 kilometers closer to Europe, offering better route opportunities (according to Jacobs (2013) especially to high-yielding Africa, with less diversion to the east), and has a larger catchment area near its hub(more than 11 million inhabitants in Istanbul alone, more than Qatar [2 mln] and the entire United Arab Emirates [5 mln] together [2011 statistics of Central Intelligence Agency (2014)]). With that it has maybe more grow potential than the Gulf carriers.

Figure 15 Turkish Airlines, a special case

What also helps the Gulf carriers to grow is the **lack of red tape**. While incumbent airlines are often hindered by many strict rules, in the Gulf region regulation is more relaxed. This is also a result of the small connections between industry and government. Most illustrious example is Sheikh Ahmed bin Saeed Al Maktoum of Dubai, who is president of the national regulator, chairman of the national airline (Emirates) and chairman of the national airport operator (Parker & Kerr, 2013).

Strategies of the Gulf carriers

Although all Gulf carriers are labelled the same, there are significant differences among them. Around the world, there last 15 years are known by alliance forming and other forms of consolidation.

Nowadays three **alliances** dominate passenger air transport: Star Alliance (founded in 1997), One World (1999) and Sky Team (2000). Together the airlines of these alliances transport more passengers than the non-affiliated airlines (many LCCs are in this group). The rationale of alliances is the ability to offer larger networks to passengers and lowering costs.

In the Americas and Europe, cooperation between airlines went even further as the sector **consolidated**. Many large airlines merged to even larger airlines. For instance, in Europe, Air France merged with KLM, British Airways with Iberia and Lufthansa acquired Austrian Airlines and Swiss. In the Americas, American Airlines merged with US Airways, Continental with United, Delta with Northwest and LAN with TAM. In contrast with the market, the Gulf carriers started to take over the world on their own.

Qatar has maybe the most traditional approach of all Gulf carriers. Last year, in 2013, they joined One World. The result of their business model is also more in-line with other traditional carriers; they do not dump tickets to (extremely) low prices, and their passenger growth rate is not as high as the other Gulf carriers, although it is still above industry average (18 million passengers in 2012, from 14 million in 2009, averaging a growth of 8.7% p.a.). Today (September 2014) 125 aircrafts form Qatar's passenger fleet.

Emirates is on a lonely road, trying to conquer the world on its own. Is has a limited number of codeshare agreements, mostly to access domestic markets (which otherwise could not be serviced by Emirates as it would be illegal). Further it tries to use as many and as large as possible aircrafts to create a major network. Emirates is the main user of the largest commercial airlines, the A380, using almost half of the A380 frames in the world, and many more on order. Their strategy is very fruitful, with an average growth rate of 12.8% for the last years (44.5 million passengers in 2013, from 27.5 million in 2009). Also their fleet is by far the largest of al Gulf carriers. It is hard to give a number, as they add new aircrafts to their fleet monthly, but the current number (September 2014) is 216.

Etihad has dusted off an old, less successful, strategy of building an equity-based alliance. As Clark (2013) summarizes, over the last two years they invested more than one billion dollar in struggling carriers on three continents. It uses this airlines to access restricted markets. For instance, as Vasagar (2014) reports, Etihad has acquired a 49,9% stake (which is the maximum foreign ownership allowed) in Air Berlin, the second largest airline in Germany. With Air Berlin it can offer direct and indirect flights from Stuttgart and Berlin, according to McWhirter (2012) and Ginten (2013) two cherished destinations of Emirates, to Abu Dhabi. It is a risky strategy, as it has bankrupted a very solvable airline, Swissair, also known as the flying bank, before, but so far it has paid off with an average annual growth rate of 17.0% (11.5 million passengers in 2013, from 8.4 million in 2011. Etihad's fleet consists currently (September 2014) of 91 aircrafts.

Network overlap with legacy carriers

To see the impact of the Gulf carriers to legacy carriers, it is also important to compare the network overlap. Therefore three tables are included, with respectively the market shares of the markets Amsterdam – Bangkok (Table 10) and Manchester-Bangkok (Table 11), as well as the most important markets of the Gulf carriers for flights to and from the United States (Table 12).

First two Europe – Asia routes, starting with Amsterdam – Bangkok. This is a special route, as the competition on this route is fierce; there are three direct carriers flying passengers between Amsterdam and Bangkok: KLM, and the Taiwanese airlines China Airlines and Eva Airways, both continuing their flights to Taipei. In Table 10 is displayed the direct competition is harder than the competition from Emirates (other Gulf carriers were not present on this route in 2010). Only 2 per cent of the total number of passengers travelling between Bangkok and Amsterdam (and vice versa) is flying via Dubai, and the cost difference is just 13% in the advantage of the indirect carrier. An explanation between the relatively low direct market share of KLM can be found in the fact it is also carrying a lot of passengers, transferring in Amsterdam or Bangkok to or from other flights; the Taiwanese carriers are more focussed on PP traffic, as an inbound hub-carrier.

Table 10 AMS-BKK O/D-traffic in 2010, split in market shares per airline (Lieshout, 2012)

Carrier	Stops	Share	% KLM fare
China Airlines	-	44%	-39%
Eva Airways	-	24%	-45%
KLM	-	18%	
EgyptAir	Cairo	2%	-54%
Emirates	Dubai	2%	-13%
Lufthansa	Frankfurt	1%	-23%
Other carriers	Various	1%	
Total		**100%**	

KLM is **more hurt** by the Gulf carriers on the **passengers transferring** from Europe to Asia **in Amsterdam**. Therefore the traffic figures on the route Manchester – Bangkok are included (Table 11), as on this route both KLM as the Gulf carriers are offering indirect routes. In this example Emirates is having the largest chunk of the market, which

is in total for 80% in the hands of the Gulf carriers. The price difference with Emirates is low; Etihad and Qatar Airways offer significantly lower prices. KLM is the forth airline, with a higher market share than the British national carrier, British Airways, which is also more expensive.

Table 11 MAN-BKK O/D-traffic in 2010 (Lieshout, 2012)

Carrier	Stops	Share	% KLM fare
Emirates	Dubai	37%	-6%
Etihad	Abu Dhabi	29%	-40%
Qatar Airways	Doha	14%	-27%
KLM	Amsterdam	5%	
British Airways	London	4%	7%
Air France	Paris	3%	-24%
Others	Various	9%	
Total		**100%**	

Both examples are to Bangkok, a popular destination in Asia for European carriers. But when comparing the destination overlap of the Gulf carriers with the legacy carriers, it shows they operate mainly on different markets.

In Table 12 the 10 largest origin/destination airports of passengers on Gulf carriers to and from the United States are listed. Besides the hub airlines of the Gulf carriers, all destinations can be found in Southern Asia. Unfortunately data to and from the Netherlands is not available, but as KLM is also operating on this market (USA to Asia and vice versa) it can be used to compare network overlap.
Comparing the destinations with the network of KLM, only the bold printed airports are overlapping: the three home bases of the Gulf carriers – Dubai, Abu Dhabi & Doha – and Delhi. All other airports are not served by KLM. As KLM **underserves** this region, it is unduly to state the Gulf carriers are direct competitors to KLM's network.

Table 12 O/D traffic markets to/from USA with Gulf carriers (August 2013 to August 2014) (CAPA, 2014b)

	Emirates		**Etihad**		**Qatar**	
	Source	Share	Source	Share	Source	Share
O&D	**Dubai**	18%	**Abu Dhabi**	18%	**Doha**	9%
1	Hyderabad	8%	Lahore	7%	Kathmandu	5%
2	**Delhi**	6%	Hyderabad	6%	Dammam	4%
3	Mumbai	5%	Ahmedabad	5%	Kochi	4%
4	Dhaka	5%	Mumbai	5%	Hyderabad	4%
5	Bengaluru	5%	Islamabad	5%	Chennai	4%
6	Chennai	4%	Chennai	5%	Ahmedabad	3%
7	Tehran	3%	Karachi	5%	**Delhi**	3%
8	Karachi	3%	**Delhi**	4%	Dhaka	3%
9	Kochi	3%	Dhaka	4%	Bengaluru	3%
10	Ahmedabad	3%	Bengaluru	4%	Karachi	3%

Concluding, it can be said that the Gulf carriers have a distinguishing strategy, compared with legacy carriers. Emirates has much potential, as oldest and largest airline, creating its own worldwide network. Qatar is more traditional, joining an airline alliance, partnering with other airlines. Etihad is the stranger in their midst, having an (presumable) infinite amount of money, investing in an equity alliance, like Swissair 15 years ago did. They profit from favourable tax environment for airlines in their home countries. Low taxes, or tax exemptions on labour and companies lower the operational costs of an airline, but is it state aid, or local policy to stimulate business activity?

KLM is most hurt on the routes via Amsterdam; on direct routes between Amsterdam and Asia KLM barely encounters competition of the Gulf carriers. This is partly due to the preference of direct flights, but also due to a different destination portfolio.

Future perspectives of the Gulf carriers

Research question 3b: Which scenario presents a possible future for the Gulf carriers, based on the current playing field?

In this part will be explored what the possible role of the Gulf carriers in the future can be. First elements, which are crucial for the development, will be listed. Thereafter three scenarios based on this elements will be drafted, including a sort of upper boundary scenario, and lower bound scenario, to study the best and worst case scenario. The third scenario is more or less an extension of the current situation. All scenarios will be independent of the presence or absence of a level playing field.

Scenario focus

Looking back at Figure 7, the system dynamics model will reveal the most important elements for the behaviour of the Gulf carriers (stability or growth): capacity, demand and costs. Capacity and demand are vital to remain balanced, to cater the growth, without overcapacity (what could lead to dropping ticket prices). To remain viable it is important to have a cost structure, which incurs higher revenues than costs.

When observing deviations in future paths of the three elements, there no problems in **demand** can be expected. Air transport is a growing market, especially the markets in the Gulf region due to globalisation. Regarding demand the Gulf carriers will have an advantage over the legacy carriers.

Capacity is a larger problem area for the Gulf carriers. Growing is a healthy situation for a company, but growing too fast can result in problems. There are three related elements to capacity in the model: capacity itself, orders and load factors. Grow problems can occur when capacity is not sufficient for the company size, for instance the fleet or home airport, and the orders cannot be delivered on time. On the other hand, when capacity grows too fast, load factors can plunge. Nevertheless when looking ahead with appropriate forecasts, this issue can be dealt with.

The biggest issue for the Gulf carriers is related to the **costs**. According to the model in Figure 7 this element can also be split into three parts: costs of capacity, salaries and tickets (although the last is mainly a negative cost, revenue). Nowadays the costs of capacity and salaries are heavily subsidised for the Gulf carriers. Aircrafts can be financed cheaply by export credits or government financing, home airport costs are limited charged and salaries are tax-free. Even tickets can bare costs – a government fee to buy traffic – but this is allegedly and absolutely not proven. As it is not known how long this environment is sustainable, this is the biggest risk for the Gulf carriers, and more risky than for the less subsidised legacy carriers.

The exogenous factors are more or less equal to all players in the industry, though the Gulf carriers can have advantages when fuel prices rise, due to their modern, more fuel efficient, fleet.

Although the different strategic choices of the Gulf carriers can lead to different results, it is likely its future path will be similar to one of the scenarios. This is because of the way the scenarios are constructed, based on binary options (see also Annex B). The scenarios will be used to determine the **boundaries** of the impact of the Gulf carriers.

Scenario 1: No money, no glory

The gulf carriers (are flying on government funding, and) will disappear in time

Aircraft and airport technology is expensive. Without proper funding a good location, intermediate between large markets – Europe and Southeast Asia – and relaxed regulation will not guarantee a successful airline and hub. Otherwise many other countries would have the potential to start their own 'Gulf' carrier.

Nowadays there is a favourable tax environment in the home countries of the Gulf carriers. This contributes to the lower cost-base of the Gulf carriers (see Figure 16 and Annex G), compared to incumbent carriers. But, when (financial) support for these measures drop, together with alleged other subsidies, and it can have serious consequences for the Gulf carriers. As stated in Chapter 1, margins in air transport are thin, so the Gulf carriers can loose their cost-advantage quickly.

Besides the cost advantage the Gulf carriers have also their geographic advantage. Nevertheless direct flights are always shorter, and quicker. This also creates a risk of increasing fuel prices, or more hub bypassing.

A combination of both developments can be devastating for the Gulf carriers, as they loose their advantages over legacy carriers – and have to compensate passengers for the extra stop compared to direct flights. Thereby they loose their grounds of operation, and will have to find a new business model or they will be out of business.

The impact for the Netherlands for this scenario is limited. As no gulf carrier will exist when this scenario becomes reality, there are no direct positive effects, although indirectly maybe KLM can growth taking over (a part of) the hub function of the Gulf carriers. The only negative effect of this scenario is the lost of the Gulf carriers flights to Schiphol.

Scenario 2: Just another competitor

The gulf carriers are just like any other airline, (set up with government money but in time) they will compete independently with the incumbent carriers

When assuming the Gulf carriers do not solely run on government support, they apparently can operate as any other airline. Many airlines started with help of the government, and became later independent (private) companies. It is imaginable that the Gulf carriers will follow a similar trajectory. Maybe in time they will find the limitations of their business models, and will look for joining the incumbent carriers. Maybe also Emirates and Etihad will join an alliance, or will there be a consolidation among the Gulf carriers.

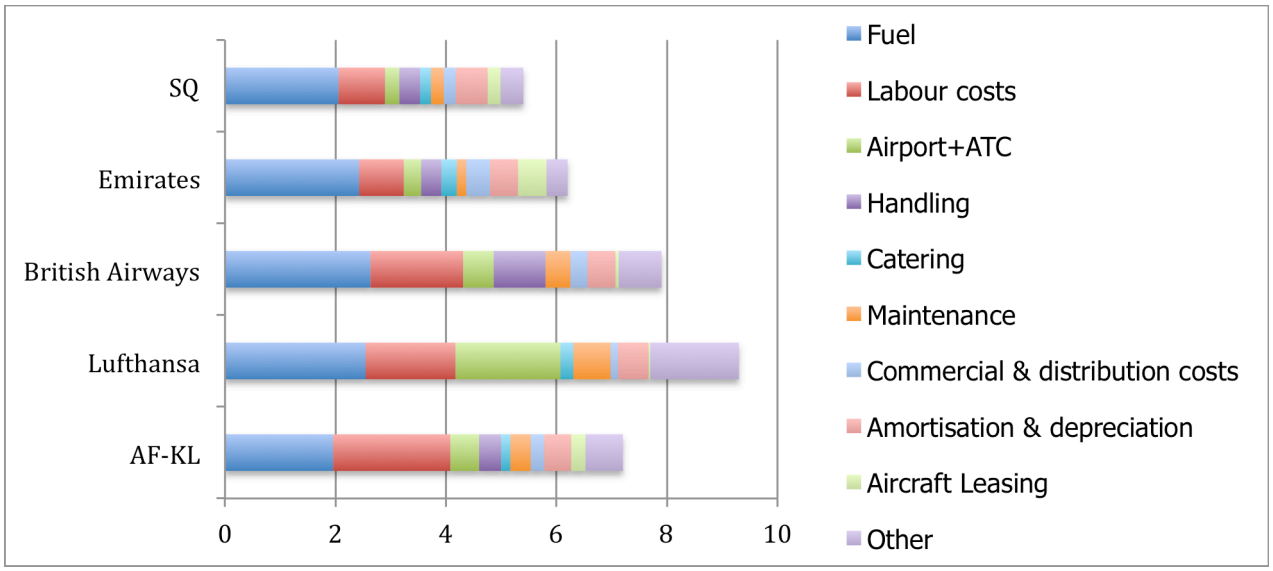

Figure 16 cost bases of incumbent carriers, compared to Emirates and Singapore Airlines

As long as the Gulf carriers do not erode the network of KLM (too much), it is likely this scenario will be positive for the Netherlands. Every new connection brings positive benefits, and as long as the negative benefits are lower of absent, in total the Netherlands will be better off.

Scenario 3: Airline empire

The gulf carriers will acquire a dominant position in air transport worldwide, (thanks to unlimited financial resources,) and will push incumbent carriers of the market

If the Gulf carriers can exploit their advantages in the right way, they can be the worst nightmare for legacy carriers. Nowadays the two most important hindering institutions towards global expansion are their hub airports, which can handle only a limited traffic, and global protectionism, prohibiting many flight options. When both issues are solved, the way to worldwide domination of the Gulf carriers is paved.

Although this scenario seems unfortunate for the Netherlands, it is not just bad. Loosing the hub function can offer new possibilities, as illustrated in the last chapter. The balance between positive and negative effects is uncertain, as it very dependent of the situation. It is impossible to give a more precise estimation of the effects of this scenario for the Netherlands.

This section has elaborated on three possible future scenarios for the Gulf carriers, and its impact for the Netherlands. Only the last scenario can turn out to be negative for the Dutch air transport system; the other two scenarios have likely no or a positive effect to the Netherlands.

Conclusions

Pursuing a level playing field might from a theoretical perspective be fair, but due to the international complexity and the fragility of air transport it might be an impossible illusion. Many airlines receive or have received various types of state aid, but airline advantages are also of a geographical nature.

Due to the different strategies, the Gulf carriers grow differently. Whichever is best is unknown: history has shown the strategy of Qatar is proven and solid; Etihad's strategy has had a miserable failed predecessor and the fleet growth of Emirates is unprecedented.

Due to the limitations in ASAs, scenario 3 is highly unlikely. Nowadays Gulf carriers are not allowed to operate direct flights in or between the markets Europe, the Americas and Africa. Indirect flights via the Gulf region are not an option, as the detour is taking too long, making it impossible for the Gulf carriers to cover these markets competitively. The Gulf carriers will be strong on routes between Europe, Asia and Africa, but the other markets are left for the legacy carriers. Maybe opportunities between city pairs in the dominant region of the Gulf carriers can be possible, if the detour via the Gulf region is too much.

Scenario 1 can become reality for Qatar or Etihad, but it is unlikely this is the case for Emirates. Emirates has proven to be financial solid, and as most transparent Gulf carrier government support is limited. Taking into account the strategies of the Gulf carriers, it is highly likely at least one of the Gulf carriers will end up with scenario 2; scenario 3 is highly unlikely for any Gulf carrier. This conclusion came also up during the interviews, as described in Annex B.

The impact of these scenarios is either neutral or positive for the Netherlands.

5

Conclusions: no new playing field

The Gulf carriers are a select group of airlines from the Arabian Peninsula, which seem to profit from the increasing market size for air transport between Asia and the rest of the world. Due to the developments of technology, increasing range, capacity and fuel efficiency, they are able to offer extremely competitive tickets. Supported by their local governments who have limited red tape for their expansion plans, and offer them extremely reduced tax rates, the Gulf carriers have created a business model that scares legacy carriers. This trend led to the main question "*How do the Gulf carriers influence the economic contribution of air transport to the Dutch society?*".

Sub question 1: a framework for influences and change

When assessing the changes that the rise of Gulf carrier bring to existing air transport systems in Europe, multiple perspectives are possible. Most logical is considering the Gulf carriers as endogenous developments in the air transport market, which in the worst case will lead to an evolution in the system. But due to the (alleged) external funding, it is also possible to consider the Gulf carriers as exogenous trends, incurring a more severe impact: a new system structure.

Many theories can be applied to the developments of this research. A number of theories in the areas of economics, geopolitics and spatial economics was selected, to cover all aspects of air transport. Four theories – evolutionary economics, hegemonic stability theory, transport geography and world-systems theory - all with a cyclic base and covering one or more of the research areas, the framework of influence and change and the three sub systems are extended into an integrating framework, see Table 13. This framework can be used to assess the effects of influences. To do so, the appropriate sub system must be selected, before the change of the influence can be compared with the concepts in the table. When a match is made, the likely effect – temporary or permanent – comes up.

Table 13 Change types split per sub system, copy of Table 5

	Air transport system		
	Technology	Market Size	Regulation
Temporary – endogenous	System behaviour (selection of variety)		
Temporary – exogenous	Disturbances		
Permanent – endogenous	Innovation	Change of intermediacy & semi-periphery	New agreement types
Permanent – exogenous	Inventions	GDP-development	Hegemon change

This framework can be used as an assessment tool to answer the sub question "*How can systemic changes in air transport be assessed?*". With the panarchy concept in mind, not all sub system of air transport have the same change origin - influence combination.

From a technological perspective, the Gulf carriers are not revolutionary. Some parts of their operations are innovative, especially Emirates with its fleet of large aircrafts only, but the technological approach of the Gulf carriers is not game changing.
Regarding the market size, the Gulf carriers are in between the old world (Europe and North America), with relative limited GDP growth, and the new world (Africa and Asia), with significant growth figures. They are in the sweet spot for a new intermediacy hub.
On the regulation sub system the Gulf carriers are not making a difference. They make attempts to attract governing bodies to the region, for instance by hosting conferences, but no serious moves are imminent.

Sub question 2: the connection between air transport and regional economies

When observing the added value of air transport to local entities, a separation between two groups of companies must be made: airlines and airports. Via the airport, airlines contribute indirectly to the GDP, see Figure 17. A distinction must be made between different types of airlines: a hub airline with many intercontinental connections will likely contribute more than a LCC without a hub.

Figure 17 Contribution of air transport to GDP, simplified version of Figure 11

The most important players of the system in the Netherlands are Amsterdam Airport Schiphol and KLM. KLM operates more than half of the flights at Schiphol, both in flight frequency as well as in Available Seat Kilometres. KLMs business model relies on transfer traffic, resulting in a transfer passengers' ratio of almost $^{2}/_{3}$ on KLM flights. KLM feeds its network mainly with passengers from the United Kingdom, Germany and Norway.

KLM's high transfer passenger rate incurs very limited margins for KLM. It works as a leverage, but it also makes their business model extra vulnerable to market disturbances. This has a direct effect to Schiphol, as during economic downturns it will see a strong decrease in passenger volumes.

The second sub question "*What is the value of KLM to Dutch society?*" is hard to answer simply. In absolute terms KLM accounts more than half the traffic, in passenger and aircraft movement numbers, as well as more than half of Schiphol's destinations, although only 30% is only served by KLM. The relative contribution of KLM to Dutch society is more complex, due to the different contributions of the different types of passenger traffic. KLM's passenger mix is different than the other home carriers, due to its hub-spoke network. On one side it is likely this results in more premium O/D-passengers, but on the other side lit generates less normal O/D-passengers, as two third continues its journey to another airport. Focussing on the different contributions of the passengers' mixes is not in the scope of this research. Thus can be concluded the contribution of KLM to Schiphol is significant, though it is unknown whether this contribution has a higher or lower value to the Dutch society than other airlines (pro ratio). This is also dependent of the political vision used to assess the contribution, as the correlation between destinations and passenger volumes is substantially less than one.

Sub question 3: the future impact of the Gulf carriers

The last pillar of this research focussed on the developments of the Gulf carriers. After elaborating on their history and strategy of the Gulf carriers, it can be concluded that the Gulf carriers are not equal. Their growth strategies are quite different; Qatar is the most traditional, Emirates is the most aggressive with its fleet expansion plans and Etihad has strategy to build an equity-based alliance. On direct routes the Gulf carriers are competing for KLM, although limited. KLM serves their home airports, but there is no significant ticket price difference and the market is small. KLM suffers more as a result of passengers, which used to travel via Amsterdam, leaking away to the Gulf carriers. This is especially the case on routes to and from the United Kingdom, boasting a significant presence of the Gulf carriers. On the other hand, the overlap of the network of the Gulf carriers and KLM in Asia is limited.

Looking at the future, it is not likely problems will arise in demand or supply, as both will balance each other out, while their operating markets keep growing. The most challenging element of the air transport system will be costs, for all carriers, so also the Gulf carriers. Their current cost-advantages are partly attributed to government policy, favouring national airlines over foreign airlines.
From a technological perspective the Gulf carriers will likely be dependent of the current aircraft manufacturers, as developing their own aircraft technology is unlikely to happen soon, due to the long throughput time. The same applies for regulation, which often is closely connected to aircraft technology. Their operating market is promising, as they are close to many emerging economies. Besides their cost structure this could be their biggest advantage over the legacy carriers.

To answer the last sub question, "*Which future scenario is most likely for each Gulf carrier?*", it is highly likely that at least one of the Gulf carriers will end up within the second scenario sketch – becoming a competitor to legacy carriers, without significant advantages other than geographical advantages. The impact of this scenario is more positive than negative. It is unlikely just one or more Gulf carriers will erode KLM's network, while they increase the connectivity of Schiphol. The first scenario can become reality for a Gulf carrier, most likely Qatar and/or Etihad, as they are allegedly more dependent of external capital, but it is unlikely this scenario will become reality for all Gulf carriers. The impact of this scenario is rather neutral.

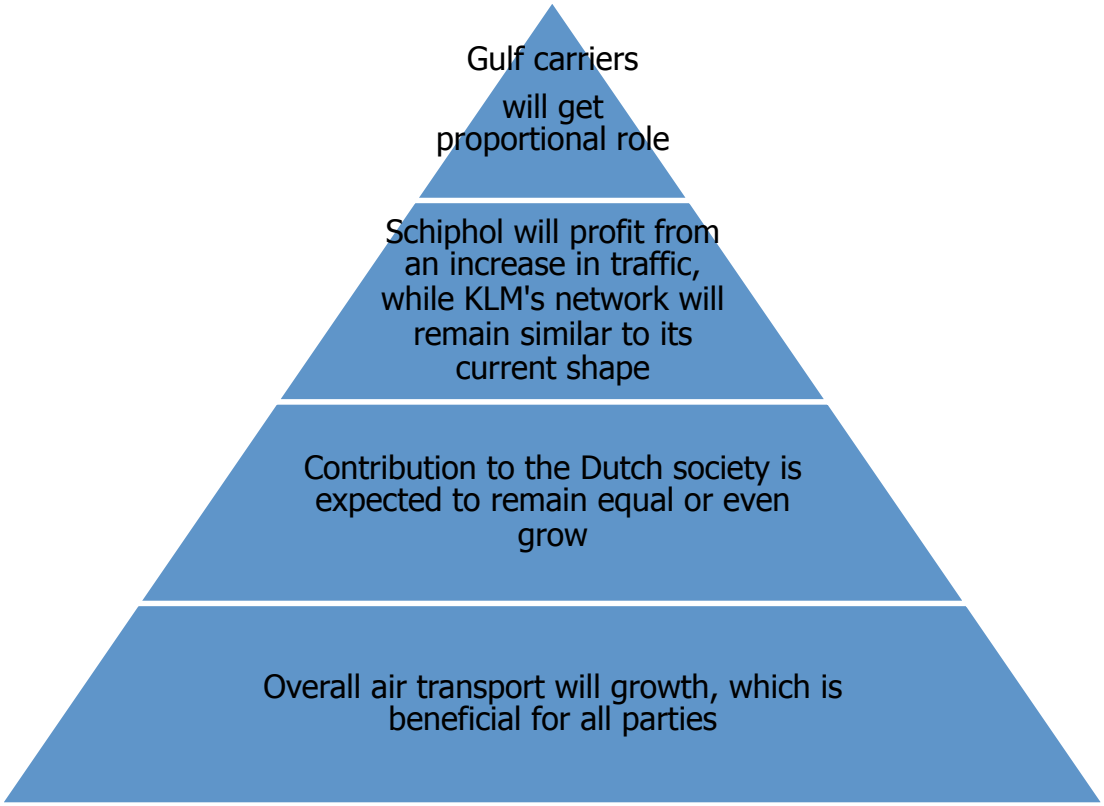

Figure 18 The impact of the Gulf carriers on the research scope

Returning to the main question, multiple answers are possible on different levels of the focus, see Figure 18.
On the level of the Gulf carriers, it is highly likely at least one, maybe more airlines will establish themselves as a sustainable player in the Gulf region, transporting passengers between Asia and the rest of the world, including Europe.
One step up in the focus, it can be concluded that this proportional role will have limited effect to KLM. Competition of the Gulf carriers is present, but their network overlap is limited, and competition will only take place on routes to Asia. Schiphol however can profit of the Gulf carriers, as it can lead to an increase in passenger volume and destinations. The Gulf carriers will not affect other Dutch carriers.
The economic effects of these consequences are uncertain, partly because of their dependence on political choices. The Dutch government recognises the importance of KLM's network, but (currently) does not choose to protect KLM,

nor to manage the network quality of Schiphol. When volumes and number of destinations growth, the overall effect to the contribution is positive. But when one of both aspects lack behind, the contribution depends on the political vision.
When the current trends are extrapolated, it seems unlikely that the Gulf carriers will fundamentally change air transport, neither worldwide nor on the air transport system in the Netherlands. They fulfil a role as competitor for KLM, and thus have a rather advantageous effect on the airline network, rather than a damaging effect on the economic contribution of air transport in the Netherlands.

Recommendations

As concluded, the impact of the Gulf carriers to the Dutch air transport systems and society is limited. Their advantages over legacy carriers are not sufficient enough to outcompete them on all fronts, and it is likely the legacy carriers will remain operating at least a part of their network, which cannot be taken over by the Gulf carriers.

Despite this fairly harmless conclusion, an important issue arises: the influence of the Gulf carriers is partly a political trade-off between volumes and destinations. Without the political vision, it is impossible to assess the impact of the Gulf carriers completely. This is because of the importance of an airline hub is partly a political choice. When air transport volumes are more important than a strong network, the arrival of the Gulf carriers can be positive, as cheaper air tickets induce more passengers. But, when the political opinion is reversed, the effect is also reversed – the arrival of the Gulf carriers is bad for a country. Currently a clear vision of the Dutch government on the role of airports and hub airlines is missing.

A clear vision can help home carriers to prepare for upcoming changes. When they know Gulf carriers put their routes to a certain region under pressure, they can focus on other regions. They know what they can expect – being a hub airline focussing on destinations or a point-to-point airline focussing on volumes -, and can act according. This clear vision is also one of the strong assets of the Gulf carriers: due to their vertical integration of the system, they know their government is on their side and will protect them into a certain extend when necessary. Red tape is limited and in case of system changes all parties can act quickly.

Furthermore it is advisable to remain monitoring the developments in the Gulf region. Changes to this region and/or carriers can change the assessment as done in this research, as different categories in the framework can become applicable. The current strategies of the Gulf carriers will not lead to a worldwide network, with operations on other markets. But if, for instance if they will find a way to operate hubs outside the Gulf region, for example Etihad with partner airlines in other regions, a new situation can exist. Although the probability of this scenario is low due to high levels of protectionism in air transport, the impact can be enormous – it can be considered as a black swan event.

Reflection

This research is based upon a number of assumptions and choices to delimit this research. In this section these assumptions and choices will be discussed, to reflect on this research.

In chapter 1 a focus is presented. This research is focussed on the impact of the Gulf carriers, while there are more trends affecting the Dutch air transport system. These trends are excluded in this research to limit the scope of this research, as their correlation with the trends of the Gulf carriers is none. However when legacy carriers' networks are eroded from multiple sides, this can have an amplifying effect.

Further this chapter deals with the contribution of air transport to a country. Besides a strong economic relation – direct and indirect – it has many social benefits. Some of these social benefits can be included in indirect economic benefits, like accessibility, while others are complex to operationalize. To limit the complexity of this research, these non-economic social benefits are excluded. Thus this research on benefits is not complete, though the most vital elements are included.

The second chapter deals with the system air transport. By using a system approach, more elements are included than in an econometric approach. To keep the research comprehensible, and due to the focus on behaviour rather than output, a qualitative approach is more suitable. As key feature of constructing models, also the models used in this chapter are simplifications. A balance is found between added value of more sub systems or theories, and the magnitude of the model. For instance the used sub systems is limited to three, as it is the minimum to show the

behaviour of the market, while adding other sub systems, like airports or financial support, make it unnecessary complex. This complexity is passed to the succeeding schemes, while these elements can also be connected to the used sub systems (airports are reflected in market size, as supplier of demand, and financial support is connected regulation).

Another important choice in this chapter is the connection with ecology. Air transport is a system with an economic base, having no connections with biology or ecology. However, taking an unconventional perspective can help to understand new trends better. Especially ecological systems can help in this, as this type of system is sometimes prone to extreme exogenous forces, turning the system upside down. Thus theories on this research area can help to understand extreme behaviour. However, as this is a side step in this research, only one theory is used. It helps to understand system behaviour of air transport, without dealing with complex differences in ecological theories.

The last choice in this chapter is the selection of theories. To connect with the cyclic system behaviour, theories with a cyclic nature are selected. Here again a framework is developed, with minimum slack but maximum effect. An all research areas covering theory does exist – world-systems theory – though the effect for assessing air transport is limited, especially on the economic area. This leads to the use of evolutionary economics, as it helps to explain economic cycles. Two supporting theories are added, HST and transport geography, as the first enhances the world-systems theory elements of dominating countries, while the latter enhances the geographical element of air transport. The used theories are all qualitative, as the focus is on the underlying structure to explain the output, rather than the output itself. Due to the different areas of the theories, there are no conflicts. Even the all covering theory has no conflicting elements, as it is not connected with evolutionary economics or transport geography, as it is in another league (social/international relations versus econometric). HST has overlap with world-systems theory, but their view on dominance is comparable, where HST elaborates more on this field.

Chapter 3 is another interesting section, connecting the air transport system with regional economies. In the real world this connection is extremely complex due to many complex mutual dependencies. To simplify this connection, this research assumes the most important revenues of airlines reach regional economies via airports. This makes it possible to focus on Schiphol for the Dutch situation as largest airport in the Netherlands, rather than regions and other smaller airports. For Schiphol KLM is the largest airline, as shown in the analysis of Schiphol. As only airline in the Netherlands with a hub-spoke network, later the focus is on solely KML at Schiphol. Assumed is other airlines are not effected by the Gulf carriers, as they operate in different markets. This is not entirely true, as some airlines serve other holiday destinations that are also served by a Gulf carrier. Nevertheless the impact on the network of these holiday airlines is limited to a handful of destinations, and they are more flexible to change destinations due to their point-to-point network.

The last part of this chapter focuses on de-hubbing, to illustrate Schiphol's dependency of KLM. Hereby is assumed the three used reference airports are comparable to Schiphol. However this is not entirely true, as the size of KLM and their hub-operations are larger than the hub-airlines at the referenced airports. Every airport has unique characteristics, but for illustrative purposes it is possible to compare these de-hubbings.

In the fourth chapter is elaborated on the Gulf carriers. As stated, Turkish airlines is not included, as it has a different geographical position, and has a substantial catchment area – in contrary to the Gulf carriers. To limit the future scenarios, only the Gulf carriers are included in this research (see also the reflection on the placement of this research in the light of other trends).

For the network overlap also a quantitative analysis to introduce a qualitative analysis. Assumed is the market USA – Asia is also relevant for KLM, as KLM is strong on the transatlantic market, also transferring passengers to the Far East and vice versa. Assumed this market is exemplary for other markets, like UK – Asia, at least regarding behaviour. The scenarios are not used for an extensive scenario analysis – the main purpose to include these is to scan the possible future space of the Gulf carriers.

Last reflection is on the generic integrating research method. Integrating qualitative and quantitative elements can be difficult, as a different level of research can be applicable. In this research quantitative elements are used to get a notion of the system, and as examples, with the underlying structure in qualitatively researched. This way a nice balance between micro (airline/airport/route), meso (region/country) level than macro level (system) is achieved. This

qualitative macro level approach enables all relevant aspects, including the connection between aspects, making it fairer than other research, which is often from a non-neutral perspective, depending on the commissioning party.

The advantage of the system approach, is also it can be extrapolated, to other trends. Especially the theoretical framework is generally applicable: as long as the level of resilience can be determined, and the origin of a change (event), it can be categorised. For similar changing competition events, same theories can be used, while other events, like pandemics, might require new theories to fill the framework.

The major disadvantage of this research method is the dependency of resilience. It is very hard to determine the exact tipping point, as this can be fluid, constantly changing. Nevertheless estimations can be made, like in this research, which can be used as reference for assessment. When the difference between estimated effect and resilience is arguably significant, the event can be seen as below or above tipping point.
Another disadvantage of this research the mutual competition between the Gulf carriers is not included. Due to non-transparency of these airlines, individual assessment is almost impossible. For instance mutual strengthening or weakening effects cannot be included.

All in all the power of this research is the combination of various sub research. The findings are not ground breaking, but the combination and outcome of the research is unprecedented. Focussing on the structure rather than the outcome is new, especially on the system part of Dutch society. It can be used as manifesto to strengthen the Dutch air transport sector, even with the Gulf carriers.

Further research

With solving the main question of this research, many more research topic came up. In this section a number of interesting knowledge gaps are listed:

- The tipping point of a HS-network: a network requires a minimal size (critical mass) for offering advantages above point-to-point connections. What is the minimum size of a profitable hub-spoke network for airlines? And has an airline with a high rate of transfer traffic, like KLM, a lower tipping point?
- Categorisation of airlines for an airport by economic impact: as concluded, LCCs and FSCs do not have the same economic contribution to local economies. But which type of airline does contribute more to local economies? And how are these differences reflected during times of re-hubbing?
- Impact of restrictive policy: several countries, like Canada and Germany, have restrictions on frequencies and/or the number of destinations for Gulf carriers. What are the consequences of these policies? Do they protect their national airline? Or do they deprive their local economies of opportunities?
- Effect of hub bypassing: smaller, more fuel-efficient aircrafts seem to be the current trend for aircraft manufacturers. This can enable hub bypassing: more passengers fly direct to their destinations, instead of via a hub. This will have consequences for HS-networks: what will the impact be of hub bypassing for carriers relying on a significant share of transfer passengers, like the Gulf carriers and KLM?
- The position of British Airways: although they can be counted to the legacy carriers, they are one of the rare examples not complaining about the Gulf carriers. This seems strange, especially because of the impact of the Gulf carriers to the UK market: it is the largest destination in Europe regarding capacity. Why does British Airways not complain about the Gulf carriers?
- Impact formula for air transport: although its impact has vague boundaries, the direct and indirect effects are quite well defined. Maybe it is possible to develop a formula, to calculate the impact of air transport for a country. When the rate of transfer passengers also is included, this might lead to a quantitative variant of this research.

To place this research is a larger perspective, it is also interesting to investigate:

- Other threats for legacy carriers: many suffer for years by the competition of LCCs, in Europe in particular Ryanair and easyJet. According to its aircraft order, Norwegian also wants to take a big stake of the low-cost market, not only on the short-haul market, but also longer routes, for instance to New York. This way the business model of the legacy carriers is under attack from three sides: besides the Gulf carriers, also by LCCs, on short- and long-haul routes. It is interesting to research how these other developments are a threat to the incumbent carriers, especially together.

- Path dependency: is it still possible to establish a new hub-airline, or is the market too closed and/or capital demands too high to start, as a nation, a new hub airline?
- International competition in a level playing field: when competition is geographically distributed, it is likely to be subjected to multiple (tax) regulations. Differences in regulation automatically involving an unlevel playing field. Is it possible to create a completely level international playing field?

5: Conclusions: no new playing field

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Annexes

Annex A Glossary

5th Freedom of the air	Right of an airline to continue a scheduled flight from its home country via another country to a third country
Air Cargo	Goods transported by air, either in a passenger aircraft's belly or dedicated freighter-aircraft
Air Service Agreement (ASA)	Political bilateral agreement on air transport between two countries
Air transport	Transport of cargo and passengers by airlines
Airline	Organisation operating one or multiple aircraft(s) for scheduled transport of passengers and/or cargo
Carrier	See *airline*
Direct passenger	Passenger on direct flight from origin to destination
Dutch air transport system	Role of air transport in the Dutch society: mainly economic contribution, employment and connectivity
Gulf carrier	Airline from the Gulf region, see Annex C
Home carrier	Airline with hub at airport
Hub	Base at Airport of an airline
Hub-spoke (HS) network	Network based on transfer passengers, flying them indirectly via a hub to their destinations. Transferring passengers enable higher frequencies, larger aircrafts and/or more destinations
Inbound carrier	Airline at airport, which is not its hub
Incumbent carrier	See *legacy airline*
Indirect passenger	Passenger on indirect flight from origin via other airport(s) to destination
Legacy carrier	Established carrier, older than Gulf carriers, see Annex C
Local passenger	See *O/D-passenger*
ME3	Abbreviation for Middle Eastern three, see *Gulf carrier*
O/D-passenger	Passenger with direct flight, departing at origin (O), arriving at destination (D)
Open skies agreement	ASA without restrictions on frequencies, capacity or destinations
Outbound carrier	See *home carrier*
Passenger	Human being travelling between airports by aircraft
Point-to-point (PP) network	Network based on O/D passengers, flying them directly to their destination
Scheduled air transport	Transport via carriers with scheduled operations
Transfer passenger	Passenger with indirect flight, changing flight at hub, see *indirect passenger*

Annex B Methodology of the research questions

In this annex will be elaborated on the research methods and justification of the research questions. Per research question the used methods, data sources and limitations will be explained.

Sub question 1

The first sub question is "*How can systemic changes in air transport be assessed?*". This sub question is included to analyse the system and its changes. Three research questions are drafted, to answer this sub question:

a. *How is the system air transport structured?*
b. *How can the system air transport deal with different types of influences?*
c. *Which theories can help explain changes in air transport?*

Research question 1a

Methodology	Literature research
Data source	Data for this research question is obtained by literature. This includes basic literature on air transport and airlines, but also obtained by using Scopus and Google Scholar with key words like "history", "deregulation", "liberalization" in combination with "air transport" or "aviation".
Justification	To show the multi-dimensional aspects of this problem, three sub systems are defined. For each sub system its basic history is posed, to help understand how the sub system develops. The three sub systems are chosen, as they describe both supply and demand of air transport, together with the regulator. Without one of the sub systems, an important element of the system is not included. On the other hand including other sub systems does not provide more insights. Each sub system is unique, but – as they are on the same abstraction level – they also have overlap. This overlap is important, as the interfaces are a characterisation of the complex and intertwined relations in the system air transport – on the cross section of all three sub systems. The combination of these three sub systems is simple and complete. An important consideration for this research question was the focus – airports or airlines. Together they are the core of air transport, but they have different characteristics. As the problem is at first related to airlines, the focus of this research question is on airlines. Integrating airports into this research question would create an unnecessary complex framework; the key aspects for development of airports are included in the next chapter.

Research question 1b

Methodology	Desk research
Data source	Data for this research question is also obtained by literature of Scopus and Google Scholar. Literature is a combination of classic (old) literature on system behaviour, like Darwin and Holling, combined with literature of last decade, with keywords like "cycles", "cyclic behaviour" and "air transport".
Justification	The aim of this question is to translate the behaviour of the system – change - into a generalised framework. Later this framework can be used to structure theories helping to assess the impact of the Gulf carriers (see research question 1c) First step is to operationalize the system. The unit of measurement is determined, by a simple analysis of the links between the different used KPIs in air transport. RPK turned out to be the best indicator: it embeds the most important elements - volume, distance and load factor. Remark, this parameter only measures passenger traffic; integrating cargo was too complex, while the added value was limited. Due to the limited impact of cargo, and the lack of freely available data, the focus of this sub analysis was on passengers only. After determining the unit of analysis, a graphical representation of the performance of this unit is presented. Data on air transport, especially long-term trend data, is hard to obtain freely. Therefore

	this research provides a sample. This sample illustrates the behaviour, while the interconnectedness with the larger system can be used as argument it is representative for the system as a whole. Although the sample provides visual indications for cyclicality, to prove the existence of cycles in this system the structure is observed. The system dynamics model of air transport shows multiple negative feedback loops with delays, which can result in cyclic behaviour around a stable equilibrium. With this cyclic behaviour as starting point, a framework of different types of change can be constructed. Important notions are Holling's concepts resilience and panarchy, as they incorporate the versatility of change.

Research question 1c

Methodology	Desk research
Data source	Literature on the four used theories is obtained via Google Scholar and Scopus, with the theory names as keywords. Further the snowball method is used, to find existing literature on connections between the theories.
Justification	The last research question of this part is trying to connect theories, which on first sight seem not linked, to the air transport. To structure this question, the framework of research question 1a is enhanced, to use it as stepping stone to connect various theories. The selection of the theories is based upon their cyclic nature, their assessment value and their connection to the four defined research areas. These research areas are selected, as they cover all aspects with minimal overlap. The theories are obtained by two trajectories. The first was to find an all-covering theory, which resulted in world-systems theory, although with a snowball method also hegemonic stability theory came up, explaining some essential elements of world-systems theory clearer. The second strain focussed on theories applied to air transport before, which resulted in transport geography. Using a snowball method led eventually to a combination with evolutionary economics, which was also included as it enriched the theoretical framework.

Sub question 2

The second sub question is "*What is the value of KLM to Dutch society?*". This question aims on two parts of the focus pyramid: the contribution of air transport to local economies (research question 2a and 2c, and the application of this theory to the Dutch situation (2b). The research questions are:

a. How are air transport and regional economies connected?
b. How much does Schiphol dependent on KLM's operations?
c. What will happen to an airport when a home-carrier ceases its hub-operations?

Research question 2a

Methodology	Desk research - first quantitative, later qualitative
Data source	To obtain the quantitative data a single source is used, to minimalize differences of calculations, to maximize comparability. A search quest on academic and non-academic search engines led to Oxford Economics, as most complete reliable data source. Terms like "impact", "economics" and "air transport" on Google Scholar and Scopus, as well as browsing through references in the found papers, were used for obtaining literature for the qualitative part.
Justification	The aim of this research question is to discover how air transport is connected to regional economies. For this the market part of the system comes up. Despite the well-defined direct and indirect effects, and a single multi-country research, with a uniform measurement for the catalytic

	benefits, it is not generalized quantifiable how air transport is connected to regional economies. The volumes show the absolute and relative impact, but this does not show how air transport is embedded in regional economies. Thus for answering this question a step back to the conceptual structure of the system will be made. The conceptual model assumes a balance between supply, generated by airlines, and demand, generated by the economy. Even though this is more a market approach, it can be seen as a subsystem of the system air transport. Unfortunately this relationship market model does not distinguish the different categories of airlines. Therefore a step more abstract is made, to include airports, which is necessary to make a distinction between inbound and hub airlines.

Research question 2b

Methodology	Case study on the role of KLM at Schiphol
Data source	Besides data from Schiphol's timetable, interviews are used to validate the used analyses. Interviews are conducted with some of the key players in the system, Schiphol and KLM, as well as with researchers.
Justification	To frame the role of the largest and most import airline of the Netherlands, KLM, this research question has a quantitative approach. It aims to illustrate the size of KLM's operations at Schiphol, to create a feeling of the size of a possible impact of a defaulting home carrier. Three analyses are made, based upon a model of Schiphol's public timetable. The first analysis is purely the capacity used by the different airlines at Schiphol. It shows on one side Schiphol's huge dependency of KLM, and on the other side the limited impact of the Gulf carriers. The next analyses are conducted to explore the dependency in more detail. The first shows the geographic distribution of KLM's feeder flights. This analysis can be used to see the possible loss of regional flights, which important for business passengers. Also these regions can be compared with focus regions of the Gulf carriers, where they can compete with KLM for indirect passengers. The last analysis is on the route competition, as this can become an issue when de-hubbing takes place. Unique routes are more likely to lose significant capacity than routes with competitors, as described in this research question.

Research question 2c

Methodology	Case study on de-hubbing, with a qualitative generalisation
Data source	This sub question relies on airport data, complemented with the interviews as described at the previous sub question and literature on de-hubbing. The sources of the airport data are the researched airports itself.
Justification	The last research question of this part will explore the consequences of losing a hub carrier, to emphasize the role of a hub airline to regional economies. Although this is a rare situation, and every situation is unique, precedents are available. The answer for this question is split into two parts. The first part elaborates on three examples, to show a defaulting hub airline does not imply serious consequences for the airport operations, although this is something different than the route quality. Due to available data only passenger volumes are taken into perspective. To make a caveat by the first part – only focussing on quantitative volume – the second part focuses on theory. It also does not elaborate on the welfare effects of the different de- and re-hubbing behaviour, but shows there is a difference, what must be kept in mind when using the conclusions of this part.

Sub question 3

The final sub question is "Which future scenario is most likely for each Gulf carrier?". With this focus on the Gulf carriers, it is possible to see better their current impact, and foresee their possible future role in the system. This sub question is decomposed into two research questions:

a. *How did the air transport playing field with the Gulf carriers develop to its current situation?*
b. *Which scenarios presents a possible future for the Gulf carriers, based on the current playing field?*

Research question 3a

Methodology	Desk research
Data source	A short history is listed to understand the background of the airlines, based on literature, newspaper articles and company data, obtained by annual reports of the respective airlines, using Google Scholar, Scopus, news paper websites and newspaper databases searching for "Gulf" and "airlines" or "carriers".
Justification	The first research question focuses on the current role of the Gulf carriers in the air transport system. Also the differences between the Gulf carriers are explored, as their different strategies can lead to different future roles. The last part of this research question is comparing the operational networks of the Gulf carriers and legacy carriers, to see the overlapping and supplementing parts, and assess the impact of the competition. This part uses analyses of other researchers and analysts, as referred to throughout this part.

Research question 3b

Methodology	Literature research and scenarios
Data source	Annual reports of the airlines are used to calculate the cost distribution, while a paper of an interviewee is used for data on the CASK. The scenarios are also discussed with the interviewees, to get a notion of their likeliness.
Justification	The last research question tries to shape a future perspective for the Gulf carriers. Three scenarios are sketched, based upon cost variations, as this factor came up to be the most uncertain element. As the scenarios are for mind setting perspectives only, they are not quantified nor tested for uncertainties.

Underlying conceptual model

In this research there are two driving forces: the role of the Gulf carriers in the system air transport, and the connection between air transport and national economies. In this part will be explained how both are connected.

Paraphrased the central question in this research is whether the Gulf carriers will be a game changer or not for the air transport industry in the Netherlands. If not, there are just three possible roles they will get.

In Figure 19 the categories of future roles of the Gulf carriers are illustrated. It shows the binary choice, being a game changer or not, with three specifications in the latter case. Together it is an exhaustive model; there is no overlap between the different roles, nor are there other scenarios possible. This model part is reflected in the scenarios of sub question 3.

The other driving force is the impact of air transport on national economies. Many countries see air transport as a spearhead of their policies due to this connection. As the Dutch air transport system is dominated by the home-carrier KLM, it is important to research the contribution of an airline hub to local economies. In Figure 20 the binary choice of the importance of an airline hub for an airport are given, with a nuance in case there is a national interest of having an airline hub. This nuance is based on theories of critical mass; an airport has to use an airline hub to grow, but can continue without this airline after a critical mass is reached (see Vespermann et al., 2008).

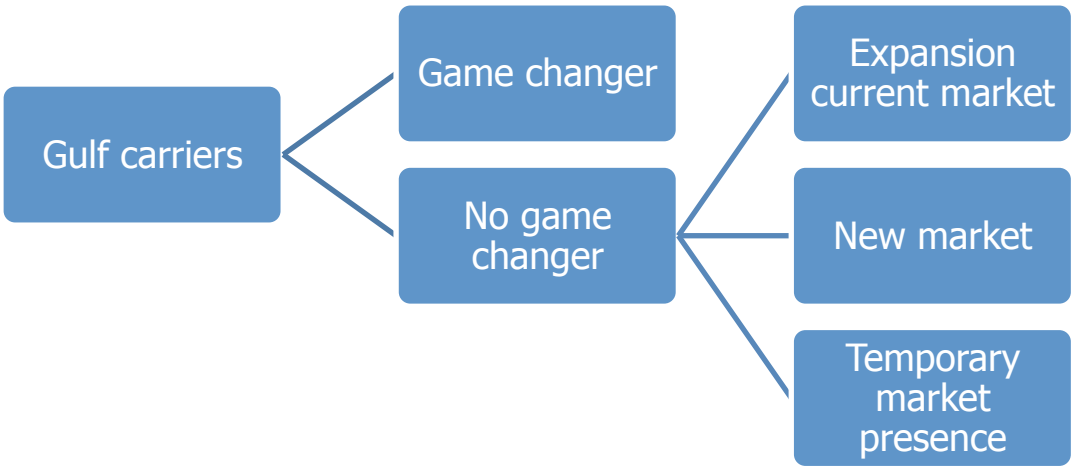

Figure 19 Possible future roles of the Gulf carriers

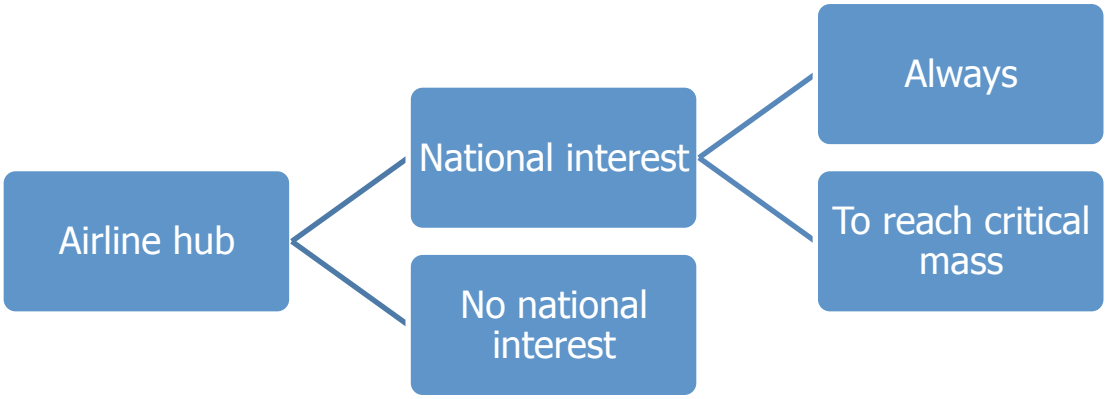

Figure 20 Importance of an airline hub to local economies

Integration of both forces

Based on the two driving forces of the previous paragraph, two sets of three propositions are drafted. These propositions are discussed with various interviewees, related to the Dutch air transport industry, to answer various sub questions.

The first set is based on Figure 19, in which the option 'new market' is ignored, as this option would not imply any impact to the legacy carriers. The three proposition options are, ordered from least to most risk for local economies:

A1: The gulf carriers (are flying on government funding, and) will disappear in time
A2: The gulf carriers are just like any other airline, (set up with government money but in time) they will compete independently with the incumbent carriers
A3: The gulf carriers will acquire a dominant position in air transport worldwide, (thanks to unlimited financial resources,) and will push incumbent carriers of the market

The second set is based on Figure 20. Again there are three proposition options, ordered from least to most risk for local economies:

B1: There is no national interest of having a home (hub) carrier at an airport
B2: Having a home (hub) carrier is essential for an airport, and therefor a matter of national interest
B3: Having a home (hub) carrier is essential for reaching a critical mass for an airport, but afterwards it is unimportant as competition is of such level they can replace the hub airline

Combining both sets, an impact table can be drafted, as illustrated in Table 14. Impact is defined as the level of negative change for the GDP, caused by the Gulf carriers.
The propositions are discussed with four interviewees, two important stakeholders (Schiphol and KLM), and two researchers, with connections to Dutch government.

Table 14 Impact table with the combined hypotheses

	A1	A2	A3
B1	No impact	No impact	No impact
B2	No impact	Medium impact	High impact
B3	No impact	Medium impact	Medium impact

On the first set of hypotheses was more or less a common view. Except the respondent from KLM, all interviewees agreed the support of the Gulf carriers by their governments was into limited extend. One of the respondents even questioned the level of state-aid of KLM. World dominance was not considered to be likely by several respondents, as the regulatory framework is not ready for this, and due to conflicting national interests probably never will be. Based on their views, hypotheses A2 cannot be rejected. The others have grounds to reject their validity, as stated.

The second set of hypotheses turned out to be more complex. The complex element is into a political choice: **what is best for a country is not pure economic rationale**. If the government wants a strong global network, a hub airline is vital; if the government is more focused on volume, an airport without a hub function can be better. Even combined with literature no definite choice on the most likely cell could be made, due to the absence of a clear government vision and/or policy on the role of air transport in the Netherlands. Also the critical mass is related to this question, making it impossible to define a uniform answer.

Annex C Stakeholders – an overview of the relevant airlines

Many airlines experience competition from the Gulf carriers. In this Annex will be explained which airlines are accounted to the Gulf carriers, and which airlines are referred to as legacy carriers – affected by the Gulf carriers.

Gulf carriers

The Gulf region exists of multiple countries. Using The Cooperation Council for the Arab States of the Gulf (2014) as reference, the following six member states form the Gulf region: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE). In Table 15 below the largest airline(s) of each country are listed. All are nowadays (September 2014) government-owned, but Gulf Air and Qatar Airways have known eras of private investors (ICAO, 2008).

Table 15 Most important airlines of the Gulf region

Country	Main airline	Founded	Passengers (million)
Bahrain	Gulf Air	1950	8.48 (2012) (anna.aero, 2014)
Kuwait	Kuwait Airways	1953	9ish (2012)
Oman	Oman Air	1993	4.995 (2013)
Qatar	Qatar Airways	1993	18ish (2012/2013)
Saudi Arabia	Saudi Arabian Airlines (Saudia)	1945	25.24 (2013) (Saudia, 2015)
UAE			
Abu Dhabi	Etihad Airways	2003	11.5 (2013) (Etihad Airways, 2014)
Dubai	Emirates	1986	44.537 (2013-2014)

Although Saudia is the second airline in passenger numbers, it is not considered as one of the Gulf carriers. It has a different business model than Emirates, Etihad and Qatar. It focuses more on domestic and Hadj-flights than bringing passengers via its hub from Europe to Asia or Africa, or vice versa. In this research the big three, Emirates, Etihad and Qatar, will be considered to be the Gulf carriers.

Incumbent carriers

There are two different groups of legacy carriers: those from Europe (see Table 16) and those from Asia (and Australia, see Table 17). In the old days European carriers flew to colonial outposts. Later Asian carriers also started to operate on this (profitable market). This market is most hurt by the Gulf carriers, due to limited alternative markets. As the American airlines are limited affected by the competition of the Gulf carriers, they are not included in this research.

Table 16 European incumbent carriers

Country	Main airline	Founded	Passengers (million)
France/ Netherlands	Air France - KLM	2004 (1933 & 1919)	78.4 (2013)
Germany	Lufthansa Group*	1953	104.6 (2013)
Spain/ United Kingdom	International Airlines Group (Iberia and British Airways)	2011 (1927 & 1974)	67.2 (2013)

*Includes also foreign (hub) airlines, like Austrian Airlines (Austria) and Swiss International Air Lines (Switzerland)

Table 17 Asian incumbent carriers

Country	Main airline	Founded	Passengers (million)
Australia	QANTAS	1921	48.2 (2013)
Malaysia	Malaysia Airlines	1946*	17.2 (2013)
Singapore	Singapore Airlines	1946*	18.7 (2013)

*used to be a single carrier (Malaysia–Singapore Airlines)

Annex D Key transport performance indicators for airlines

The most important performance indicators of air transport are listed in Table 18. They are all related, as illustrated in Figure 21. On the left side of Figure 21 the passenger related KPIs are drafted, while on the right side the cargo KPIs are displayed. To convert passengers to cargo for comparing purposes, average weights are used. For instance, according to Berdowski et al. (2009) in Europe the average weight of an adult passenger with carry-on luggage was set to 83 kg in 1994, while later this weight was differentiated for man/woman and winter/summer, with some standardisations

Table 18 Most important KPIs of air transport, adapted version of the Glossary of British Airways (2009, p. 136) with Chaturanga (2013) and Singapore Airlines (2014a)

Available seat kilometres (ASK)	The number of seats available for sale multiplied by the distance flown.
Available tonne kilometres (ATK)	The number of tonnes of capacity available for the carriage of revenue load (passenger and cargo) multiplied by the distance flown.
Revenue passenger kilometres (RPK)	The number of revenue passengers carried multiplied by the distance flown.
Cargo/freight tonne kilometres (CTK/FTK)	The number of revenue tonnes of cargo (freight and mail) carried multiplied by the distance flown.
Revenue tonne kilometres (RTK)	The revenue load in tonnes multiplied by the distance flown.
Passenger load factor	RPK expressed as a percentage of ASK.
Cargo load factor	*CTK/FTK expressed as a percentage of ATK.*
Overall load factor	RTK expressed as a percentage of ATK.
Passenger yield	Passenger revenue from airline scheduled operations divided by airline scheduled RPK.
Total traffic revenue per RTK	Revenue from total traffic (scheduled and non-scheduled) divided by RTK.
Total traffic revenue per ATK	Revenue from total traffic (scheduled and non-scheduled) divided by ATK.

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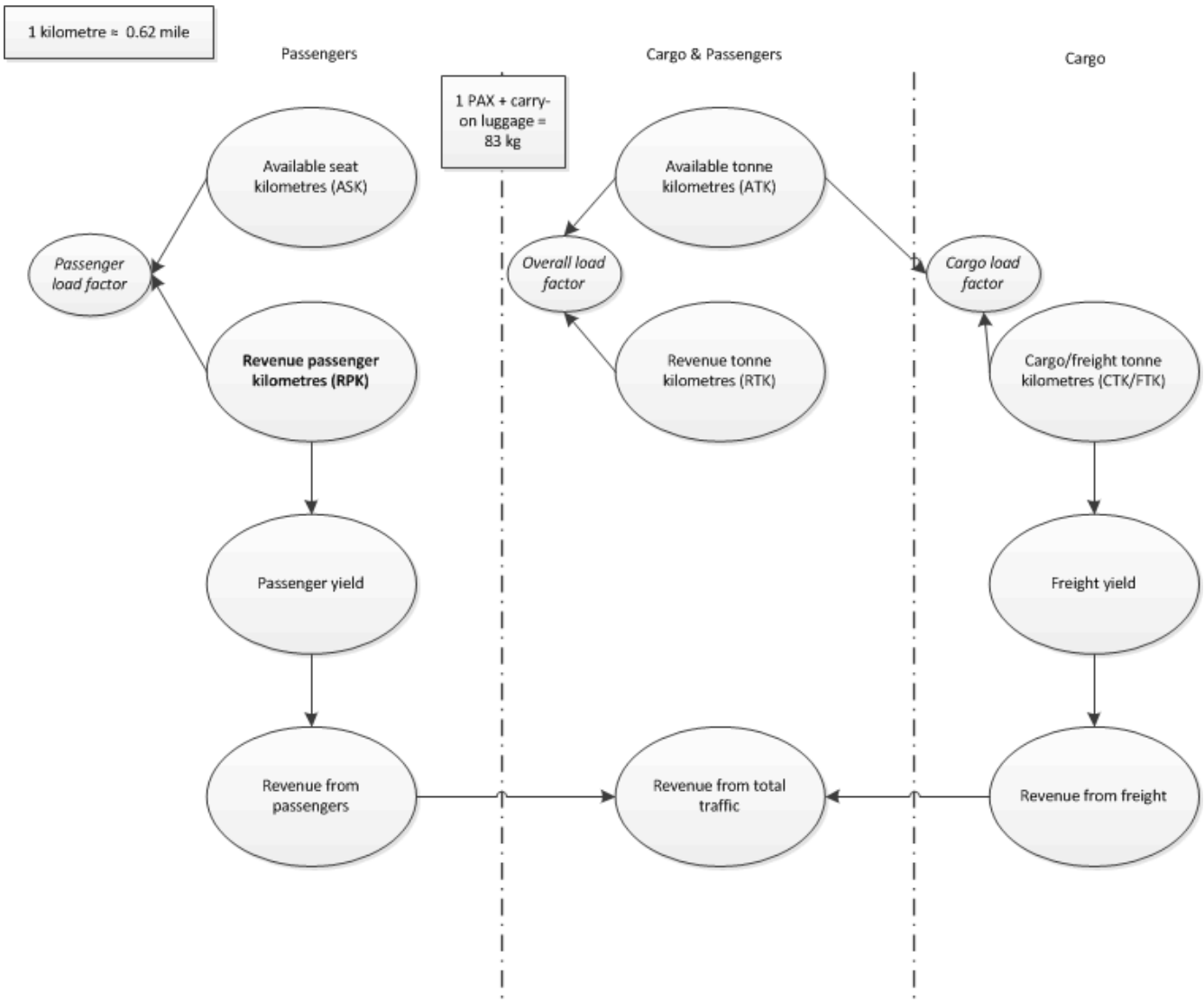

Figure 21 KPIs of air transport

Annex E Benefits of air transport per country

The exact benefits of air transport are difficult to enumerate, as the definitions of the effects are vague due to different approaches. Various indirect effects are included in many researches, while sometimes even catalytic results are accounted to the benefits of air transport.

Altogether the various definitions and researches make it is hard to compare the benefits of air transport among countries. To make a unbiased overview of the benefits, in this research data from one research company, Oxford Economics (2014), will be used. All data is calculates with the same approach, making it possible to compare countries without definition differences. The individual country reports of Oxford Economics (2014) are merged into Table 19.

Oxford Economics makes a distinction between the following four contributing elements of air transport to a country:

1. Direct contribution (by airlines and airports, including ground services)
2. Indirect contribution (by supply chain for airlines and airports)
3. Spending contribution (second order effect, by salary spending of employees from the previous two groups)
4. Induced contribution (tourism benefits, which are 'catalysed' by air transport)

Elements one to three are together the contribution of air transport to the GDP, while element 4 is seen as induced benefits.

Table 19 Benefits of air transport in billion euros[4]

Country	Contribution to GDP	% of GDP	Direct	In-direct	Employees spending	Induced
Australia	22.24	2.6%	9.38	7.64	5.14	30.37
Austria	3.60	1.3%	1.80	1.20	0.60	0.90
Azerbaijan	0.39	0.8%	0.21	0.12	0.06	0.48
Belgium	5.80	1.7%	2.50	2.40	1.00	1.90
Brazil	10.46	1.0%	4.35	3.76	2.39	3.23
Canada	23.52	2.2%	11.79	6.64	5.01	6.43
Caribbean Islands	1.94	1.4%	1.01	0.54	0.47	0
Chile	1.85	1.6%	0.97	0.49	0.40	1.65
China	41.62	0.8%	15.94	17.08	8.73	7.72
Colombia	1.40	0.7%	0.58	0.53	0.30	2.07
Czech	0.87	0.7%	0.40	0.28	0.19	0.27
Denmark	2.65	1.2%	1.37	0.75	0.52	0.28
Ecuador	0.22	0.5%	0.11	0.06	0.05	0.44
Egypt	1.62	1.2%	0.83	0.53	0.25	8.78
Finland	5.83	3.2%	2.78	1.74	1.31	1.22
France	61.80	3.2%	26.20	21.80	13.70	13.40
Germany	47.90	2.0%	22.20	15.60	10.10	15.10
Greece	5.70	2.5%	3.30	1.10	1.30	8.40
Hungary	0.76	0.9%	0.35	0.25	0.16	0.26
Iceland	0.66	6.6%	0.28	0.24	0.15	0.62
India	4.20	0.5%	1.87	1.36	0.98	7.41
Indian Ocean Islands	0.26	3.1%	0.15	0.04	0.07	0
Ireland	4.10	2.6%	1.90	1.30	0.90	5.30

[4] For non-euro countries, the exchange rate of September 18, 2014 is used to convert the benefits

Israel	2.83	1.6%	1.45	0.72	0.66	1.91
Italy	12.70	0.8%	4.70	5.20	2.80	10.90
Japan	22.38	0.7%	9.69	7.44	5.25	9.75
Jordan	0.46	2.2%	0.21	0.13	0.12	0.63
Kenya	0.21	1.1%	0.11	0.05	0.05	0.51
Korea	6.20	0.8%	3.50	1.31	1.39	10.83
Latvia	0.15	0.8%	0.08	0.04	0.03	0.22
Lebanon	0.55	2.0%	0.31	0.13	0.11	4.03
Luxembourg	0.99	2.6%	0.64	0.16	0.20	0.36
Malaysia	1.74	1.1%	0.76	0.62	0.38	4.11
Malta	0.15	2.5%	0.09	0.03	0.04	0.96
Mexico	2.94	0.4%	1.38	0.90	0.66	10.70
Netherlands	11.80	2.1%	5.40	3.50	2.80	5.80
New Zealand	7.43	6.3%	2.20	2.58	2.64	6.04
Nigeria	0.56	0.4%	0.28	0.16	0.13	0.37
Norway	5.82	2.0%	2.78	1.72	1.32	1.70
Pacific Ocean Islands	0.20	1.5%	0.12	0.03	0.06	0
Panama	0.99	4.1%	0.58	0.26	0.16	1.36
Peru	0.55	0.5%	0.27	0.15	0.12	1.55
Philippines	0.62	0.4%	0.31	0.17	0.14	3.35
Poland	1.62	0.5%	0.60	0.64	0.41	0.38
Portugal	2.30	1.4%	1.10	0.70	0.50	3.30
Republic of Cyprus	0.62	3.6%	0.36	0.12	0.14	2.04
Romania	0.75	0.7%	0.42	0.17	0.16	0.24
Russia	8.18	0.9%	4.40	1.96	1.82	1.47
Saudi Arabia	6.24	1.8%	3.45	1.32	1.47	4.87
Singapore	8.69	5.4%	5.32	1.90	1.47	5.69
South Africa	3.58	2.1%	1.41	1.48	0.69	1.65
Spain	14.20	1.4%	6.50	4.50	3.20	40.00
Sweden	5.74	1.7%	2.85	1.62	1.26	7.36
Switzerland	7.53	1.7%	3.39	2.48	1.74	3.64
Taiwan	4.35	1.3%	2.35	1.00	1.00	4.79
Thailand	3.34	1.5%	1.54	1.06	0.75	16.30
Turkey	3.62	1.1%	1.70	1.29	0.59	10.99
UAE	12.93	6.2%	7.42	3.06	2.45	17.82
UK	62.92	3.6%	27.02	20.68	15.22	26.26
US	390.93	4.9%	160.35	131.99	98.97	129.20

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Annex F KLM at Schiphol

To give an insight in the position of KLM, this annex presents two tables. The tables are based on the timetable (so scheduled flights only) of Schiphol of the week of 3rd November 2014 (Schiphol Amsterdam Airport, 2014). This week is a normal low-season week, without special or holiday flights.

To make the data usable for analyses, a few modifications are made. These modifications are based on the following assumptions:

- The **aircraft type** used for a flight is stated in the timetable, although it is often a more general description (aircraft type family). As even the number of seats among equal aircraft type variants can differ between airlines, a generic number is used. This number is often the average between the highest and lowest known configuration.
- Some flights have multiple destinations. Two variants may be distinguished:
  - **Triangular** flights: flights from A to B to C to A. Especially holiday destinations are flown with triangular flights, as the demand for seats to a single destination is insufficient to fill a plane. For ASK calculations the seats of the aircraft are equally distributed to each destination, so 50% to B and 50% to C.
  - **Tag-on** flights: flights from A to B to C to B to A. Often used for aircraft use optimization, or destinations outside range. For ASK calculations only the distance A to B to C is used, as this also include the distance A to B.

Table 20 is a specification of KLM's destinations. It shows on an aggregated level (per country) how many cities KLM serves, the total number of seats to the country, including the share of total KLM's seats per week, the number of flights to the country and the part of KLM's ASK to each country.

Table 20 Destination country distribution of KLM from Schiphol, w/c 3 Nov 14

Country*	#Destinations	Seats per week	% Country total	Frequency per week	% of ASK
GB	13	43280	13.81%	387	2.00%
DE	10	29168	9.31%	290	1.17%
NO	9	20668	6.59%	175	3.03%
IT	6	15904	5.07%	126	1.46%
US	7	14348	4.58%	53	9.27%
FR	5	13332	4.25%	111	0.90%
CH	3	11862	3.78%	97	0.69%
DK	3	11680	3.73%	97	0.61%
ES	3	11158	3.56%	77	1.36%
SE	3	9440	3.01%	76	0.86%
AN	4	6630	2.12%	20	4.64%
CN	5	6328	2.02%	23	4.84%
CA	3	5916	1.89%	19	3.34%
JP	3	5314	1.70%	17	4.46%
ID	2	4872	1.55%	14	5.21%
EC	2	4872	1.55%	14	4.29%
ZA	2	4872	1.55%	14	4.14%
RU	2	4200	1.34%	28	0.78%
BR	2	4176	1.33%	12	3.68%
AE	2	3619	1.15%	14	1.70%
TZ	2	3570	1.14%	14	2.31%

FI	1	3150	1.00%	21	0.44%
AT	1	3150	1.00%	21	0.27%
HU	1	3150	1.00%	21	0.33%
IN	1	2856	0.91%	7	1.65%
KE	1	2856	0.91%	7	1.73%
BE	1	2786	0.89%	35	0.04%
PL	1	2758	0.88%	21	0.28%
TH	1	2676	0.85%	7	2.24%
CZ	1	2632	0.84%	28	0.17%
PH	1	2436	0.78%	7	2.35%
SQ	1	2436	0.78%	7	2.33%
TW	1	2436	0.78%	7	2.09%
MY	1	2436	0.78%	7	2.27%
PA	1	2436	0.78%	7	1.95%
PE	1	2436	0.78%	7	2.33%
MX	1	2358	0.75%	9	1.97%
TR	1	2100	0.67%	14	0.42%
PT	1	2100	0.67%	14	0.35%
KO	1	1834	0.59%	7	1.43%
HK	1	1834	0.59%	7	1.55%
BH	1	1785	0.57%	7	0.92%
NG	1	1785	0.57%	7	0.83%
KW	1	1785	0.57%	7	0.71%
SA	1	1785	0.57%	7	0.76%
UG	1	1785	0.57%	7	1.03%
GH	1	1785	0.57%	7	0.85%
RW	1	1785	0.57%	7	1.05%
LU	1	1596	0.51%	21	0.05%
GR	1	1350	0.43%	9	0.27%
QA	1	1275	0.41%	5	0.57%
OM	1	1275	0.41%	5	0.65%
SR	1	1224	0.39%	3	0.84%
UA	1	1050	0.33%	7	0.17%
IL	1	1050	0.33%	7	0.32%
AR	1	1044	0.33%	3	1.09%
CL	1	1044	0.33%	3	1.19%
EG	1	1044	0.33%	3	0.31%
CU	1	1020	0.33%	4	0.72%
KZ	1	765	0.24%	3	0.37%
HR	1	658	0.21%	7	0.07%
AO	1	510	0.16%	2	0.32%
Total	**132**	**313465**	**100.00%**	**2070**	**100.00%**

*** ISO 3166-1 alpha-2 codes, see http://en.wikipedia.org/wiki/ISO_3166-1_alpha-2**

Table 21 gives an overview of all airlines with scheduled flights in the week commencing November 3, 2014. Also is per airline calculated what the market share of flights (frequency).

Table 21 Airlines market share at Schiphol, w/c 3 Nov 14

Code*	Airline	Frequency share	Capacity (ASK) share	Number of routes
KL	KLM-Royal Dutch Airlines	50.4%	56.2%	132
DL	Delta Air Lines	4.4%	10.0%	9
HV	transavia.com	4.0%	2.9%	32
UA	United Airlines	1.1%	2.7%	4
OR	Arke	0.7%	1.9%	10
EK	Emirates	1.0%	1.8%	1
CZ	China Southern Airlines	0.6%	1.8%	2
U2	easyJet	7.9%	1.5%	20
SQ	Singapore Airlines	0.4%	1.5%	1
MH	Malaysia Airlines	0.4%	1.5%	1
CX	Cathay Pacific Airways	0.4%	1.3%	1
GA	Garuda Indonesia	0.6%	1.2%	2
CI	China Airlines	0.3%	1.1%	2
KQ	Kenya Airways	0.4%	0.8%	1
CND	Corendon Dutch Airlines	0.8%	0.8%	15
TK	Turkish Airlines	1.0%	0.8%	2
BR	Eva Airways	0.2%	0.7%	2
EY	Etihad Airways	0.3%	0.5%	1
XC	Corendon Airlines	0.6%	0.5%	5
KE	Korean Air	0.2%	0.5%	1
VY	Vueling Airlines	1.1%	0.5%	5
SU	Aeroflot Russian Airlines	0.6%	0.5%	1
AF	Air France	2.3%	0.4%	3
US	US Airways	0.2%	0.4%	1
PY	Surinam Airways	0.2%	0.4%	1
SK	SAS Scandinavian Airlines	1.4%	0.4%	3
AZ	Alitalia	1.0%	0.4%	2
EI	Aer Lingus	1.4%	0.4%	2
BA	British Airways	2.8%	0.4%	3
PC	Pegasus Airlines	0.4%	0.3%	1
LY	El Al Israel Airlines	0.3%	0.3%	1
TB	Jetairfly	0.1%	0.3%	4
AT	Royal Air Maroc	0.4%	0.3%	3
LH	Lufthansa German Airlines	1.7%	0.3%	2
IB	Iberia	0.6%	0.3%	1
RO	Tarom	0.4%	0.3%	1
TP	TAP Portugal	0.4%	0.3%	2
UX	Air Europa	0.4%	0.2%	1
KC	Air Astana	0.2%	0.2%	1

OS	Austrian Airlines AG	0.6%	0.2%	1
AY	Finnair	0.4%	0.2%	1
BT	Air Baltic Corporation	0.4%	0.2%	2
DY	Norwegian Air Shuttle	0.6%	0.2%	3
BE	Flybe	1.0%	0.2%	7
IR	Iran Air	0.1%	0.2%	1
FI	Icelandair	0.2%	0.2%	1
LX	Swiss	0.8%	0.2%	1
8Q	Onur Air	0.2%	0.2%	1
MS	EgyptAir	0.1%	0.1%	1
JU	JAT Airways	0.3%	0.1%	1
PS	Ukraine International Airlines	0.2%	0.1%	1
RJ	Royal Jordanian	0.1%	0.1%	1
FB	Bulgaria Air	0.2%	0.1%	1
3O	Air Arabia Maroc	0.2%	0.1%	2
LO	LOT-Polish Airlines	0.3%	0.1%	1
OV	Estonian Air	0.2%	0.1%	1
CY	Cyprus Airways	0.1%	0.1%	1
OK	Czech Airlines	0.4%	0.1%	1
OU	Croatia Airlines	0.2%	0.1%	1
A9	Georgian Airways	0.1%	0.1%	1
LT	Air Lituanica	0.1%	0.1%	1
XQ	SunExpress	0.1%	0.1%	1
F7	Darwin Airline	0.2%	0.0%	2
K2	Eurolot	0.1%	0.0%	2
B2	Belavia	0.1%	0.0%	1
4U	Germanwings	0.3%	0.0%	1
VR	Tacv Cabo Verde Airlines	0.0%	0.0%	1
A5	HOP!	0.2%	0.0%	2
LS	Jet2.com	0.2%	0.0%	1
TU	TunisAir	0.1%	0.0%	1
KM	Air Malta	0.1%	0.0%	2
JP	Adria Airways	0.0%	0.0%	1
SI	Blue Islands	0.0%	0.0%	2
SX	Sky Work Airlines	0.0%	0.0%	1
Total		**100.0%**	**100.0%**	**230 (unique)**

*** IATA airline codes, see http://en.wikipedia.org/wiki/List_of_airline_**

Annex G Cost structure of relevant carriers

In this appendix the costs of a number of relevant carriers is explained, to display the differences. Due to availability of data, in this appendix only Air France – KLM, British Airways, Emirates, Lufthansa and Singapore Airlines are included. Nevertheless this set of carriers provides a geographic distribution, illustrating regional differences.

In Table 22 the absolute costs per cost group per airline are listed. Due to limited report style, the catering item is included in handling for British Airways, and Lufthansa's handling is included in Airport and ATC charges.

Table 22 Costs distribution per costs group (Air France - KLM, 2014; British Airways Plc, 2014; Emirates, 2014a; Lufthansa Group, 2014; Singapore Airlines, 2014b)

	Air France – KLM (mln EUR)	British Airways (mln GBP)	Emirates (mln AED)	Lufthansa (mln EUR)	Singapore Airlines (mln SGD)
Fuel	6,897	3,755	30,685	6,576	5,702
Labour costs	7,482	2,392	10,230	4,203	2,336
Airport & ATC Charges	1,839	790	3,954	4,908	717
Handling	1,405	1,340	4,648	included in above	1,039
Catering	589	included in above	3,529	605	549
Maintenance	1,303	643	2,146	1,746	642
Commercial & distribution costs	852	439	5,421	344	605
Amortisation & depreciation	1,725	722	6,421	1,431	1,601
Aircraft Leasing	913	85	6,548	75	650
Other	2,385	1,104	4,794	4,147	1,143
Total	**25,390**	**11,270**	**78,376**	**24,035**	**14,984**

In Table 23 the costs of the previous table are recalculated to a costs distribution. Although it offers opportunities to compare the different airlines, it is sometimes easier to do this with absolute costs, as displayed in Table 25. To create this table, the relative costs are multiplied by the CASK per airline (Table 24).

Table 23 Relative costs per airline

	Air France – KLM	British Airways	Emirates	Lufthansa	Singapore Airlines
Fuel	27%	33%	39%	27%	38%
Labour costs	29%	21%	13%	17%	16%
Airport & ATC Charges	7%	7%	5%	20%	5%
Handling	6%	12%	6%		7%
Catering	2%		5%	3%	4%
Maintenance	5%	6%	3%	7%	4%
Commercial & distribution costs	3%	4%	7%	1%	4%
Amortisation & depreciation	7%	6%	8%	6%	11%
Aircraft Leasing	4%	1%	8%	0%	4%
Other	9%	10%	6%	17%	8%

Table 24 Costs per Available Seat Kilometre (CASK) in eurocent (De Wit, 2014)

Airline	CASK (€ct)
Air France – KLM	7.2
British Airways	7.9
Emirates	6.2
Lufthansa	7.9
Singapore Airlines	5.4

Table 25 CASK per cost group in eurocent

	Air France – KLM	British Airways	Emirates	Lufthansa	Singapore Airlines
Fuel	1.96	2.63	2.43	2.54	2.05
Labour costs	2.12	1.68	0.81	1.63	0.84
Airport & ATC Charges	0.52	0.55	0.31	1.90	0.26
Handling	0.40	0.94	0.37		0.37
Catering	0.17		0.28	0.23	0.20
Maintenance	0.37	0.45	0.17	0.68	0.23
Commercial & distribution costs	0.24	0.31	0.43	0.13	0.22
Amortisation & depreciation	0.49	0.51	0.51	0.55	0.58
Aircraft Leasing	0.26	0.06	0.52	0.03	0.23
Other	0.68	0.77	0.38	1.60	0.41