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The effect of an increase in the Low Cost Carrier capacity on the level of European Economic Integration

A theoretical and empirical analysis

Abstract: This paper theoretically and empirically investigates the relationship between the Low Cost Carrier (LCC) activity and the level of European Economic Integration (EEI). Furthermore it tests the hypothesis that the effect of an increase in LCC capacity has a stronger effect on the level of EEI than the effect of entering the Eurozone. On the basis of theory it is expected that an increase in the capacity of low cost airlines would positively affect economic integration. LCC capacity is expressed as a capacity share and as the absolute number of LCC passengers. In this paper different models have been tested and I argue that the models based on the absolute number of LCC passengers are the most reliable. However, both varieties deliver mainly negative and significant effects for the LCC activity. The effect of the Euro is significantly positive in the majority of the models. Therefore the hypothesis that the effect of the low cost airlines is at stronger presence than the effect of the Euro should be rejected. Although the results are quite robust, the models suffers from some serious limitations and therefore the results should be interpreted with high caution and future research is recommended.

Keywords: low cost carriers, low cost airlines, European economic integration

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Table of Contents

1. Introduction

In the aftermath of World War II, the principles of the European Union (EU) were created. The main purpose of the EU by then was fostering economic collaboration. The idea was that if countries collaborate by means of trade, they become interdependent which will reduce the likelihood of conflicts and unrest. This development led to the creation of the European Economic Community in 1958 and increased cooperation between six countries: Belgium, Germany, France, Italy, Luxembourg and the Netherlands. Since then, the single market was created and continued to develop towards its full potential (European Union, n.d.). Currently the EU is an economic union that maintains free trade in goods and services, sets common external tariffs among members and allows the free mobility of capital and labour. Within the EU there is also a monetary union, the EMU (European Monetary Union). The EMU establishes the common currency the Euro among a group of EU countries (Suranovic, 2010).

Many debates are ongoing about the level of European economic integration (EEI). Some argue that the EU is quite far in the integration process, while others agree that there are many steps to be taken in order to become an integrated union. For example, Bowen e.a. (Bowen, Munandar, & Viaene, 2011) state that many reforms are still needed to proceed the economic integration among EU member states, while Jean-Claude Trichet of the European Central Bank argues that there is evidence that there has been stronger economic integration among EU countries than among other countries, and that this integration is still increasing (Trichet, 2007). In order to study EEI, it is important to understand what determines EEI.

Integration is a multidimensional concept that covers economic, political and social integration. In his book Convergence, cohesion and integration in the European Union, Leonardi describes economic integration as a process that develops over time, resulting in a decreasing gap between the EU's rich and poor areas. The gap will decrease even faster as more economic resources are invested in peripheral countries and regions. Historical experience has shown that in the absence of countervailing policies, integration could lead to overall negative impacts for peripheral regions. Because of transport costs and economies of scale, economic activity would be shifted away from the peripheral community. This finding arouses the idea that location and transportation could be important determinants of EEI as well, and this seems to be confirmed by Leonardi's study. According to his study, European integration is determined by the level of industrialisation, unemployment, European Commission spending, investments and the

distance to the core of the region (Leonardi, 1995). This latter element reflects the probable importance of transportation.

A study of Mussa (2000) argues that the three main dimensions of economic integration are human migration, trade in goods and services and movements of capital and integration of financial markets. The mobility of people, goods, services and factors of production therefore play an important role in his study (Mussa, 2000). This finding is supported by Bowen e.a. (2011) who state that a fully integrated economic area is an area in which "*goods and factors are freely mobile and policies are harmonized*". Recent studies also elaborate on the Euro as an important determinant of EEI. Whereas Trichet (2007) argues that the adoption of the euro has fostered EEI by reducing information costs, enhancing price transparency and eliminating the exchange rate risk, a more recent study on the European equity market integration performed by Bekaert e.a. (2010) shows the opposite. According to this study, EU membership stimulates equity market integration, but this movement is independent of the adoption of the Euro. Moreover, the Euro adoption as well as the anticipation of the Euro adoption has minimal effect on market integration (Bekaert, Harvey, Lundblad, & Siegel, 2010).

Literature shows that there are many different elements that can determine EEI, and that there are many different views on the importance of these determinants. Mobility could be an important determinant of EEI as well. Mobility is among others determined by the availability of several means of transport. This paper will elaborate on the relationship between EEI and a specific element of transport: the aviation market.

The European commercial aviation market has long been regulated by a system based on bilateral negotiations. These regulations ensured that there was no airline competition on protected routes. This lack of competition, however, was in conflict with the aim of the Treaty of Rome of having a common economic market. In 1993 the Single European market has been created. This has had a strong impact on the European aviation industry and increased the number of air routes by 170% (Pisarek, 2009) (ACI, n.d.). The full liberalisation of the aviation market in 1997 gave all carriers the right to operate domestic routes within the whole European Union. This full liberalisation led to a period of unprecedented growth and introduced many new entrants into the market (European Low Fares Airlines Association, 2004). The exposure to increased competition caused interesting developments.

For many years, the European aviation market has been dominated by legacy carriers. The first European Low Cost Carriers (LCCs) were introduced in the United Kingdom and Ireland by

the ‘Southwest copy-cats’ Ryanair and easyJet in 1995. From this year on, LCCs in Europe started to experience a sharp increase in their market share. The success of Ryanair and easyJet could be attributed to the favourable economic framework that stimulated the low cost industry. Besides, the UK and Ireland were both characterized by underused airport capacity and this in combination with the willingness of managers of privatised airports to offer reduced charges to LCCs encouraged the growth of the low cost market. After the full liberalization in 1997, Ryanair and easyJet began to develop European operating bases in 1999. Growth on the continent now continued with operating bases in several European countries (Francis, Humphreys, Ison, & Aicken, 2006). Table 1 shows that in the intra-European market, the share of the LCCs has increased by 30 percentage points in 10 years.

Table 1: Low-cost carrier market share (% of seat capacity, intra-European market)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Share	8%	14%	18%	21%	25%	30%	34%	34%	37%	38%	38%

Source: (ATKearney, 2013)

In 2014, legacy airlines still represented 62% of the total European aviation market, while low cost carriers presented only 38%. However, legacy airlines increased their annual market volume by 2.8 million seats between May 2013 and May 2014, while LCCs added more than 20 million seats in this same period (OAG, 2013). These numbers show that in Europe LCCs are increasing their persistence and their market share, at the cost of the market share of the legacy airlines. According to aviation expert Guillaume Burghouwt from the Dutch economic research institute SEO, the increase in LCC capacity has brought nothing but benefits for the consumer and the economy. He states that when looking at a specific airline such as easyJet, it can be seen that easyJet responded to gaps in the market by offering flights on routes that where not facilitated before. It also offered payable alternatives to people who otherwise travelled by other means of transport, such as the train or bus. People increased their flying frequency by going abroad more often for city trips, family or business related travels. It is straightforward that the increase in seats availability increased the opportunities for mobility. Therefore the increase in LCC capacity possibly has had a positive effect on EEI. Burghouwt even states that probably the budget airlines have been more important for the EEI than the introduction of the Euro (Kleef, 2015).

This latter statement is the motivation for this research. This interesting statement is not supported by any theoretical or empirical evidence. This discrepancy between the statement

and any evidence is the trigger to investigate the effect of the LCCs on European economic integration and to compare it with the effect of the euro. The research question of this paper therefore is: *Does the increase in LCC capacity foster the level of EEI, and is this effect at stronger presence than the effect of the Euro?* In order to answer this question this research is divided into several parts. An extensive theoretical framework is sketched in which the different phases of economic integration are discussed. The concept of economic integration is explained and a connection with globalization is established. Globalization is, contrary to economic integration, a dynamic element that can be quantified. For this reason, an EEI index will be constructed, based on earlier developed globalization indices. This index covers the aspects that theory expects to determine EEI. The possible link between EEI and low cost airlines is discussed and it turns out that some researches argue that transport and (low cost) airlines in specific foster EEI, however none of them proves this empirically. Developments in the aviation market show that the LCC capacity has increased over the years and that its market share is increasing. The section on the data and methodology extensively elaborates on the construction of the EU index, its different elements and the weighting method. The empirical model will test the hypothesis that there is a positive and significant effect of LCC capacity on EEI, and that this effect is at stronger presence than the effect of the Euro. Several varieties in the index are used to test for robustness of the results and finally a different model is tested in which one element of the index is used as the dependent variable and the remaining indicators are used as the explanatory variables. All models will be tested twice: One will use the LCC capacity share as an explanatory variable, whereas the second one uses the absolute number of LCC passengers as the explanatory variable.

This paper is organized as follows: Section 2 will provide the theoretical framework on EEI. In accordance, section 3 will discuss the possible link between EEI and transport. This section also discusses the developments in the aviation market and the LCC market in specific. Section 4 provides the data and methodology whereas section 5 presents the results. Section 5 will also performs robustness checks and will elaborate on the limitations and recommendations. Finally section 6 will conclude the paper.

2. European Economic Integration

The EU is a unique community that currently consists of 28 nations that are politically and economically connected. One of the main objectives of the EU is to create an ‘ever closer union’ that fosters the economic ties between the different Member States. Therefore economic

integration is an important aspect of the integration policy (König & Ohr, 2013). Economic integration has been an interesting topic for many years and many aspects of it have been embodied in different theoretical and empirical works. As stated in the introduction, there are many different elements that can determine EEI, and opinions differ about the importance of these various elements. Before any details will be discussed, agreement on the concept of economic integration is essential.

2.1 The concept of economic integration

A general definition of economic integration explains that it can be best described as a process and as a means by which a group of countries strive to increase their level of welfare (Andersen, 2003). Economic integration can be separated into five additive stages:

Free trade

The first stage is the level of free trade. In this phase tariffs between members are significantly reduced or removed, while tariffs in regard to other countries outside of the agreement continue to exist. The goal of free trade is to create a comparative advantage and to develop economies of scale. The first phase of free trade was established in 1958, after Belgium, France, Italy, Luxembourg, the Netherlands and West Germany signed the treaty of Rome. The common market was created and goods, services, capital and people could now move freely.

Custom union

A custom union is the second level of economic integration. A custom union sets external tariffs among member countries, which ensures that the same tariffs are applied to third countries and that a common trade regime is achieved. In 1968 the EU, which by then consisted of the European Economic Community (EEC), created the custom union. All import tariffs among the six EEC countries were now eliminated.

Common market

The third stage is the stage of the common market. In this stage capital and services are free to move within the members of the common market, fostering the effect of scale economies and economic efficiency. However, the different members of the common market do keep their own regulations. In 1986, the Single European Act was adopted and a timetable for the completion of the common market by 1993 was set out.

Economic union

The economic union, also known as single market is the fourth additive level. At this level a uniform market is created by the removal of all tariffs for trade between member countries. Besides, there is free movement of labour and monetary and fiscal policies between members are harmonized. An addition to an economic union could be a monetary union, which ensures the use of a common currency. Signing the Maastricht Treaty in 1993 created the EU, reflecting the economic union. For a group of currently 19 countries the economic union is extended to a monetary union through the implementation of the common currency, the Euro. The Euro was introduced in 1999 as a virtual currency for cash-less payments and accounting purposes, and its tangible counterpart entered the market in 2002.

Political union

The final stage that can be achieved is the political union. This stage represents the potentially most advanced form of integration: a common government and significantly reduced sovereignty of member countries. Currently this stage is only found within nation states, such as in federations (Rodrigue, 2013).

Relating the EU to the integration theory of five additive stages shows that the EU successfully passed up to the fourth level of the economic union or single market. These developments suggest that the EU is a strongly integrated area and that a common government is the only phase that retains the EU from entering the final stage of a political union. However, opinions differ about the level of integration and König & Ohr state that despite integration policies, there are still large heterogeneities between member states of the EU. When analysing trade integration, monetary integration, institutional integration or capital- and labour market integration, heterogeneous outcomes are found (Köning & Ohr, 2012). Many believe that there are reforms needed to complete the economic integration among EU members. Such reforms include for example greater liberalization of the domestic labour and product markets, greater cooperation in areas that are under national control such as taxation, infrastructure and social security and the adoption of a (new) constitution (Bowen, Munandar, & Viaene, 2011).

2.2 Measuring European economic integration

As stated in the previous subsection, economic integration is a concept and it is therefore not an operational instrument. Its different phases are determined by the signing of treaties and agreements and it is hard to measure by economic indicators. Despite several studies are focussing on the explanation of this concept, there are only little that provide specific guidelines on how to measure or quantify it.

A paper by Fiess and Fugazza (2002) elaborates on the standard economic theory about integration and convergence and shows that there are three major strands in the literature of economic integration. The first one is based on the neoclassical approach of growth, building on the work of Solow (Solow, 1956), and states that a necessary condition for convergence is the existence of decreasing returns to scale in capital and technological diffusion. This results in growth slowing down over time and in this way poor countries or regions can enjoy higher growth rates than their rich counterparts. In these neoclassical models countries and regions specialize according to their comparative advantage, and therefore a low level of productivity does not have to be a barrier to gain from trade. Furthermore convergence is fostered by open economy considerations, since the flow of international trade contributes to factor price equalization and equalization of domestic products per worker. The second one is based on a theory developed by Romer (Romer, 1986), Lucas (Lucas, 1988) and Grossman and Helpman (Grossman & Helpman, 1991). Here low productivity levels are actually an impediment to trade benefits. In these theories inequality is expected to increase infinitely since rich countries and regions tend to grow faster. The third strand relies on the new economic geography theory first developed by Krugman and Venables (Krugman & Venables, 1990). These models share the driving forces of the endogenous growth models: economies of scale, imperfect competition and spill-over effects. However, they believe convergence will occur due to labour mobility (Fiess & Fugazza, 2002). This paper explains its different concepts very well and it highlights important conditions for convergence and integration. However, it does not give any concrete indicators on how to measure integration. It fails to transform the major strands into operational guidelines that can be used in the quantification. Therefore these theories are not useful for this research.

A different study does give the practical tools to determine the level of economic integration of an area. According to Bowen e.a. (2011), a fully integrated economic area is an area in which "*goods and factors are freely mobile and policies are harmonized*". In their paper, Bowen e.a. (2011) use the entropy statistic developed by Theil in 1971 to measure the extent of integration among members of an economic group. Their paper is based on three theoretical propositions that are brought together in a summary measure. The first proposition states that each member´s share of total integrated economic area (IEA) output equals its share of the total area stock of each productive factor. The second theoretical proposition addresses distribution: the distribution of output and factor shares across members of the IEA follow a rank-share distribution that exhibits Zipf's law. The third proposition states that given Zipf's law, the

distribution of output and factors across area members in the long run is unique and depends only on the number of IEA members. They empirically test the validity of these three propositions and find support for all of them. Now they use the Teil entropy statistic to obtain the summary measure by specifying the distribution of actual shares across members of a given economic group of a specific size as the prior distribution and the distribution of theoretical shares for an integrated economic area with the same size of members as the posterior distribution. Eventually, the Theil index calculates the distance to full integration (Bowen, Munandar, & Viaene, 2011). Although the method discussed and used in this paper is dynamic and enables to quantify the level of economic integration, it only captures elements related to the distribution of factors and output. In order to capture the full dynamics of economic integration a more extensive method is needed that includes more different elements of economic integration. Since economic integration is extremely conceptual, it is hard to come up with a dynamic method that covers the concept extensively. Literature has shown that it is appropriate to compare economic integration with a related concept: globalization. The A.T. Kearney / Foreign Policy globalization index (2002) is considered to be the first attempt to construct a composite measure of globalization. Several other authors followed by constructing comparable indices, such as the G-Index from Randolph (Randolph, 2001), the CSGR Globalization Index (Lockwood & Redoano, 2005), the Modified Globalization Index from Martens and Zywietz (Martins & Zywietz, 2006) and the KOF Index of Globalization (Dreher, 2006). All these indices combine data on a country by country basis which is aggregated into one statistic.

2.3 Economic integration compared to globalization

A different study specified to European integration does elaborate on the different dynamics of integration. This Economic Paper, written on behalf of the European Commission, states that integration on a global level is driven by political decisions and technological changes. These elements lead to the lowering of information- and transportation costs. The creation of the single market, the EMU and the enlargement are all factors that contributed to this integration process. When looking at trade statistics, trade flows indeed have increased within Europe, but the EU as an area is not significantly more open to worldwide trade than it was years ago. This discrepancy shows the strength or bias of the integration process of Europe relative to possible forces of globalization in goods and services trade. The growth in trade is mainly driven by an increase in intra-industrial trade, reflecting an increase in the trade in products for which the production process is not depending on the access to specific (natural) resources or on the

possibility to outsource. Both the increased intra-European trade and the stagnated worldwide trade openness imply that the location of production in Europe has become more responsive to the profitability of production. In fact, the increase in intra-European trade flows reflects a continuously changing boundary for which goods and services can be traded across borders. Activities that used to be characterized as non-tradeable, like services, are more and more becoming tradeable. The increase in the level of foreign direct investment (FDI) strengthens the mechanism, and the formation of the EMU is expected to be another factor stimulating the integration process (Andersen, 2003).

The above findings imply that some observations that are defined to be part of the integration process could actually also be an element of globalization, and that globalization in itself is perhaps the main driver behind the positive development of trade. Since globalization and economic integration share some characteristics, it is not surprising that several researchers used globalization indices to assess integration. The A.T. Kearney / Foreign Policy globalization index is considered to be the first attempt to construct a measure of globalization, after which many other attempts followed. The index tracks and assesses changes in the main determinants of global integration. These components incorporate measures such as movements of people across borders, trade and financial flows, international telephone traffic and internet usage (Amburn, 2009). All these measures differ in the amount of countries, indicators, weighting schemes and years used. Since most of these indices cover a much larger number of years and countries than would be suitable for an index for the EU, König and Ohr (2013) decided to construct a different EU index. Besides, they agree that there are prominent examples of positive integration that cannot be captured in globalization indices, such as participation in the EMU. König and Ohr constructed an EU index based on 4 main categories: EU single market, EU homogeneity, EU Symmetry and EU conformity. Each category contains several subcategories that rank countries separately on the performance of each indicator. Finally the index enables to quantify the overall level of European economic integration for all the countries separately.

Since globalization shares many characteristics with economic integration, and globalization is an operational instrument, it is reasonable to construct an index based on a globalization index. The modifications König and Ohr made to this index are relevant to capture the different dynamics of European integration. Therefore, their EU index will be used as the main guidance for the EU index that will be constructed in this paper. This index will be discussed extensively in the methodology section and it will be used in the empirical model.

In summary, this section finds that although the EU is an integrated area, its different member states differ in their state of economic development and economic integration. Economic integration is closely linked to convergence and cohesion and it shares characteristics with globalization. Because of its link with the latter, it is possible to construct a measure to quantify economic integration based on earlier developed globalization indices. This index will be constructed in section 4. Before turning to the empirics it is important to outline the developments in the low cost aviation market and to see if theory elaborates on any possible link between economic integration and the LCCs.

3. European economic integration and the role for low cost airlines

3.1 The role of transport in European economic integration

Section 2 has shown that economic integration is not dynamic, but that it is rather conceptual and that it shares characteristics with globalization. Many studies argue about the determinants of EEI and in this section any possible link between LCCs and EEI will be discussed. Before turning to the low cost market in specific, the role of transport in determining the level of economic integration is discussed.

Convergence, integration and peripheral areas

In his book, Leonardi (1995) discusses convergence, cohesion and integration in the EU. In the 1985 Single European Act cohesion is defined as 'reducing disparities between the various regions and the backwardness of the least-favoured regions'. Back then, cohesion was dependent on a belief that European economies were able to converge to similar level of development and social wellbeing. In order to achieve the goal of convergence, the EU needed to undertake a serious programme to increase factor mobility in order to let capital, technology and skills flow to less developed areas. Leonardi puts attention on the convergence of the economic wellbeing and the growth levels of the less developed regions in the EU. This is a necessary condition since higher levels of development foster the process of locally providing funding sources to finance the growth programmes that are necessary in order to reduce the gap between the rich and poor areas in the EU. These poor or less developed areas in the EU are characterized by a scarcity of skilled labour and inadequate capital supplies and infrastructure. These resources are resources that determine the circumstances for convergence and it appears that those less developed areas that are scarcely endowed with these resources are often the peripheral areas of the EU.

As mentioned in the introduction, historical experience has shown that in the absence of countervailing policies, integration could lead to an overall negative impact for peripheral regions. A large part of the existing literature confirms this finding and states that economic and political integration in the EU is not in the best interest for these regions. Because of transport costs and economies of scale, economic activity would be shifted away from the peripheral community. According to Tarrow, characteristics of peripheral regions are physical distance from the centre, an inferior allocation of economic, political and cultural resources and being dependent on the centre for its well-being (Tarrow, 1978). A research performed by Gadelshina & Vakhitova on the role of transport infrastructure in the interregional integration of the Russian Federation regions has shown that transport infrastructure plays a significant role in interregional integration. On the one hand, the transport network determines the level of interregional production of goods and services and the availability of social benefits for the residents. On the other hand, it also contributes to the realisation of close interregional relations, bringing the socio-economic situation of the neighbouring regions together. In their research in particular, the rail transport is the integrating and constituent sector and stabilizing factor of the economy (Gadelshina & Vakhitova, 2015). The importance of transport is confirmed by a study of Mūller-Jentsch (2003) on transport sector reform and deeper economic integration in the Euro-Mediterranean region. He states that the role of transport logistics and supply chain management is for firms one of the key issues. Production aspects such as the quality, reliability and cost of transport services have always been important to companies, but for a few parameters this importance has increased dramatically over time. Trends like just-in-time production, shorter time-to-market, lean manufacturing and global sourcing all need to have the support of highly efficient logistical systems. At the same time, the increased trend to outsource parts of the production and to focus on the core competences has separated the production process in smaller parts, while the accessibility of global transport has made individual production stages independent of geographical positions. Interestingly, this paper also highlights the importance of air transport in realising deeper integration. The EU has a well-developed legislative, regulatory, and institutional framework for the aviation industry, that suits well to be extended to its neighbouring countries. In their multimodal transport system of the Euro-Mediterranean region, transport by air plays a critical role in determining the transport of passengers, tourists and time sensitive goods that are high value-added. Efficient and low-cost air transport is therefore beneficial for trade in services, foreign currency receipts and employment (Mūller-Jentsch, 2003).

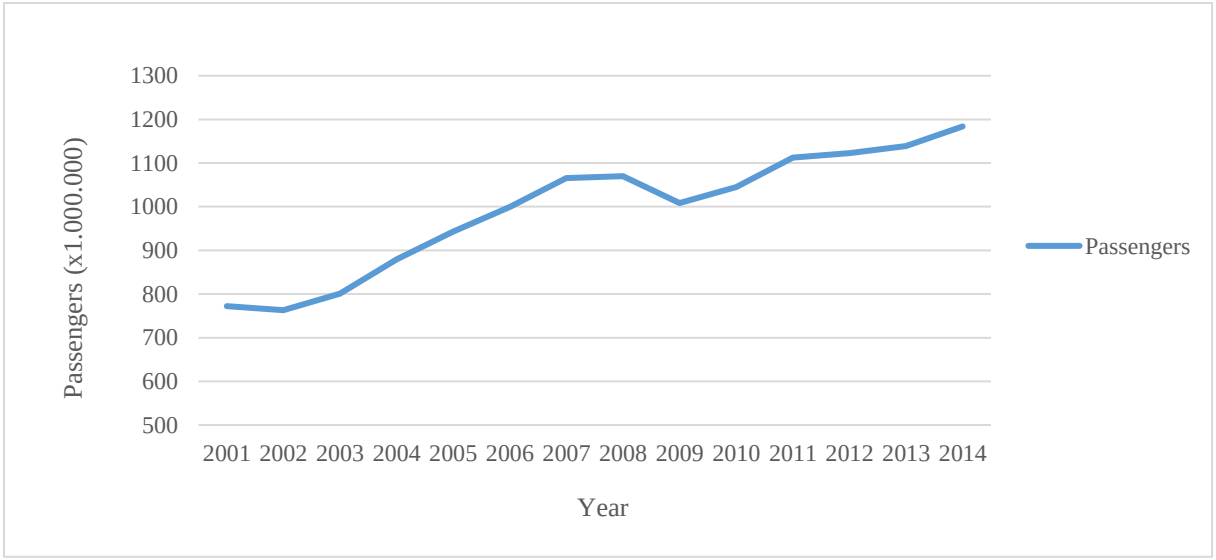
So according to several authors there is a role for transport, and possibly for LCCs in determining the level of economic integration. Before this hypothesis will be tested empirically, I first turn to the developments of the European aviation- and low cost aviation market.

3.2 The European aviation market in general

As explained in the introduction, the European aviation market has been dominated by legacy carriers for many years and it is only since 1995 that the first European LCCs were introduced. Since its introduction, LCCs in Europe started to experience a sharp increase in their market share. Before turning to the theory on the LCC market, brief attention will be paid to the development of the overall aviation market.

Over the past years there has been an increase in the activity of the European commercial aviation market. Figure 1 shows the development of the amount of passengers carried on board for a sample of 17 European countries from 2001 to 2014. With the exception of the crisis years from 2007-2010, a continuous increase can be seen from less than 800 million passengers in 2001 to almost 1.2 billion passengers in 2014. This is equivalent to an increase of around 53% in these years.

Figure 1: Development total annual air passenger transport for a sample of 17 EU countries[1]

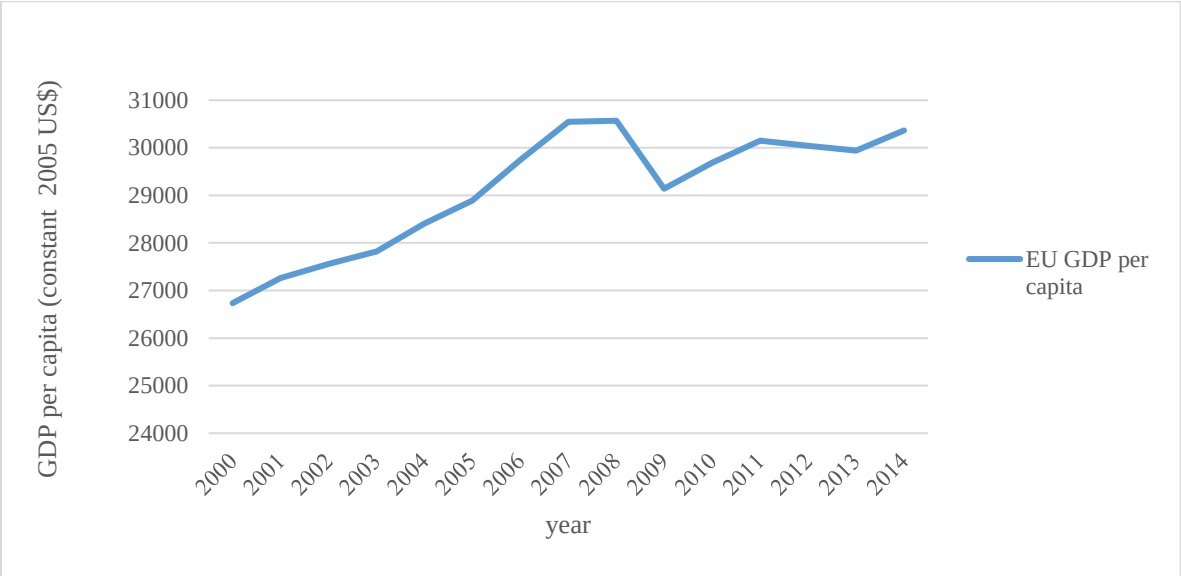


Source: (Eurostat, 2016)

[1] The sample of EU countries include Austria, Denmark, Estonia, Finland, Germany, Hungary, Italy, Latvia, Luxembourg, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

According to the Centre for Aviation (CAPA), global airline profits is a function of capacity, the economy and oil prices. Where the relationship with capacity and the economy is straightforward and positive, the relationship with oil prices is more ambiguous. Capacity is expressed by the number of fleet growth which is a function of both deliveries and retirements. Deliveries as a percentage of the total fleet have remained towards the lower end of their historic range over the past ten years. However, fleet growth started to increase since 2013 again and is estimated to continue to grow in the future. The economy is expressed in terms of GDP growth. Figure 2 shows the development of the average GDP per capita for the EU. Again, a continuous increase can be seen, with the exception for the crisis years. Therefore, the increase in total air passenger transport is no surprise since the overall level of income and economic activity increased during this period as well.

Figure 2: development of the EU average GDP per capita (in constant 2005 US$)



Source: (World DataBank, 2016)

Finally the oil price plays its role in determining airline profits. Although the relationship is somewhat complex, in general a decrease in oil prices is beneficial for the airline industry since jet fuel (refined from crude oil) accounts for 25-33% of airline industry costs. However, a decrease in oil prices often comes along with a stagnating economy. Overall the total effect of the determinants of airline profits have been beneficial over the past 15 years, resulting in an increasing total market for air traffic (CAPA, 2015).

3.3 The European LCC market in specific

The growth of the low cost market in Europe started to become possible with the EU's deregulation in 1993, the so called 'third package'. The first European Low Cost airlines were introduced in the UK and Ireland in 1995 by the 'Southwest copy-cats' Ryanair and easyJet. As table 1 in the introduction has shown, the LCC market share has increased from 8% in 2002 to 38% in 2012. After the full liberalization in 1997, Ryanair and easyJet began to develop European operating bases in 1999. Growth on the continent now continued with operating bases in several European countries. Additionally, Ryanair realised in a number of cases redefined airport profits by getting airports in effect to pay them to make use of their facilities. Although some of these arrangements were ruled by the European Commission as anti-competitive, they were not altered as a consequence since many of the arrangements could be argued to be highly transparent. Next to the appearance of new low cost airlines, several major European airlines have also established low cost counterparts. As an example, KLM responded by first introducing Basiq Air, followed by Transavia, and Lufthansa led its Germanwings subsidiary enter the low cost market. Although many new airlines were introduced, many also did not survive. Data from OAG reveals that 28% of the low cost airlines that entered the market between 1997 and 2002 vanished a few years later. This compares to 2% for legacy airlines (Francis, Humphreys, Ison, & Aicken, 2006). Overall the availability of low cost opportunities increased sharply since its introduction. As part of this increase in LCC presence was the innovation of low cost services facilitated by the Czech and Slovak governments in 2002. Both governments liberalised their bilateral agreements that allowed low cost activity with the United Kingdom. Enabling air services with the UK created opportunities for those countries to enjoy the benefits of the inbound tourism market and to prepare to join the single European aviation market. Proliferation of air services was the result of full membership of the single European aviation market and now the traditional low cost countries such as the UK and Ireland started to become more connected with East European countries. The establishment of runway capacity in those East European countries together with attractive fares increased the opportunities for Western European tourists to utilize the low cost connections to their East European neighbours (Francis, Humphreys, Ison, & Aicken, 2006).

Overall, several studies agree on the importance of transport in fostering the economic integration process. However, none of these studies actually estimates the impact empirically. Furthermore, little attention has been paid to the importance of air transport and to the best of my knowledge there has not been performed any research on the impact of low cost airlines on economic integration. In this section we have seen that LCCs have increased their market share

over the past years. In order to answer the main question if this increase in capacity actually stimulated EEI, an empirical model will be tested. In order to test this question empirically, the next section will present the methodology and will extensively elaborate on the EU index.

4. Data and methodology

4.1 Data

For this study a panel dataset is constructed, consisting of 13 countries (N=13). Due to the limited availability of data on the low cost airlines, it was not possible to include all 28 countries that belong to the EU into the sample. It was possible to obtain data for 13 countries, that could be chosen on the basis of preference. I decided to select the sample in such a way that the countries that are part of the sample differ in when / if they entered the Eurozone. The sample consists of 6 countries that joined the Euro from its introduction in 2002 onwards: the Netherlands, France, Spain, Ireland, Portugal and Greece. There are 4 countries included that joined the Euro at a later stage: Cyprus, Estonia, Latvia and Slovakia and finally 3 countries have been included that did not join the Euro at all: the United Kingdom, Denmark and Poland. This heterogeneity between the sample countries ensures a representative sample for the EU and reduces the problem of sample bias. The dataset contains strongly balanced annual data and runs from 2003 till 2014 (T=12), since for these years all the required data is available.

4.1.1 The EU index

Since the aim of this research is to measure the effect of the low cost airline development on the European economic integration, it is important to have an appropriate measure of the level of European economic integration. As mentioned in section 2, the index constructed by König and Ohr (2012) will serve as the main guideline for the index constructed and used in this paper. Inspired by this EU-index, I will construct a slightly different index that captures the relevant elements in order to quantify economic integration for the sample set of countries that will be used in the empirical model. I modified the index on the basis of available data and the relevance of the indicators. In line with the index of König and Ohr, the indicators are chosen to reflect the single market dimension of the EU, economic convergence among Member States and the symmetric developments of their business cycles. This leads to three main dimensions that cover a total of 13 indicators. These three dimensions are EU single market, EU homogeneity (capturing the degree of convergence) and EU symmetry. König and Ohr also use a fourth dimension, EU conformity. Conformity is reflected by the participation of a Member State in

important steps of European institutional integration and through their compliance with EU law. This paper differs from König and Ohr since I do not include EU conformity into the EU index. Part of EU conformity are EU membership and Schengen participation. These two elements will later be used in the empirical model as explanatory variables to explain the level of EEI. Including these indicators in the index as well would cause endogeneity problems. The rest of the elements belonging to the EU conformity category are part of the subcategory EU compliance. The indicators in this subcategory are related to infringement proceedings, representing the amount of convictions by the European Court of Justice and the number of newly introduced infringement proceedings per country per year (Köning & Ohr, 2012). Since the focus in this paper is on the economic aspects of European integration, I decided to exclude the indicators for EU compliance. Furthermore, the data on EU compliance is only limited available for the selected sample. Because of these reasons EU compliance is excluded from the index, which results in exclusion of the whole EU conformity category.

EU Single market

The single market ensures the free movement of goods and services within the EU. It also aims at improving the factor allocation within the EU, by fostering efficient intra-European movements of labour and capital. The single market indicator can be divided into two categories: EU openness and EU proportion. Part of EU openness are the indicators for trade openness (intra-European imports and exports of goods and services in percentage of GDP), capital movement (in- and outward FDI as percentage of GDP) and labour movement (employment of foreign workers). Part of the EU proportion category is trade proportion (intra-European imports and exports of goods and services in percentage of total trade in goods and services). Due to the limited data availability it was unfortunately not possible to include a measure for the EU proportion of capital movement and labour migration.

EU homogeneity

Homogeneity is desired by politicians and EU residents, and although it is only partly expected by economic theory it is an important element of integration. The optimization of intra-European factor movements and increasing intra-European trade is expected to lead to factor price equalization and the equalization of prices of goods and services. The equalization of factor prices is expected to lead to convergence of GDP levels across Member States. Traditional trade and growth theories expect that integrated economies will converge over time. However, contrary to the view of traditional theories, new trade and growth theories imply that advanced economies will benefit at the costs of less advanced economies, because of economies

of scale, spill over effects and endogenous technological progress. This development would lead to divergence between the countries of the integrated area. Despite some discussion about the real relation between convergence and integration, this paper will use homogeneity as an indirect measure of integration (König & Ohr, 2013). As part of this EU homogeneity are five indicators that reflect the most important macroeconomic determinants in that regard: per capita income (real GDP per capita at current prices), purchasing power standards, long-term interest rates (10 year government bonds), public debt ratio (gross government debt in percentage of GDP) and the tax rate on income and wealth. All measures are in relation to the respective EU average.

EU Symmetry

In order to measure the symmetry across EU member states, I will use four dimensions that all reflect a high degree of synchronization of business cycles across the countries: economic growth (growth of real GDP at current prices), inflation (harmonized index of consumer prices, percentage change to previous period), change in unemployment (percentage change of unemployment rate) and government net borrowing (percentage change of government net borrowing as percentage of GDP). All four indices are in pairwise correlation to the respective EU average. The rationale behind these dimensions is that the more goods and factor markets are integrated, the more equal are the production structures and the patterns of intra-industry trade. Therefore, symmetry of business cycles is an appropriate indicator to reflect that economies are driven for a substantial part by common external shocks and that they operate interdependently (Köning & Ohr, 2012).

The data used to construct the EU index is obtained mainly from Eurostat, WorldBank and UNCTAD. An exact overview of the data can be found in appendix 1.

4.1.2 Constructing the EU index

In order to construct a useful and convenient index that allows to compare data over time and across countries, the data needs to be transformed and needs to be normalized. Through normalization the data will range from 0 to 100, where 0 is the minimum level of economic integration and 100 represent the maximum level of economic integration. For the single market indicators, data from EU openness is normalized to:

$$I_{i,t} = \frac{X_{i,t}}{X_{\max(j,T)}} * 100$$

Where *I* represents the output for the indicator of country *i* in year *t*. The value of the variable X is compared to the maximum value obtained in all periods (2003 – 2014) and for all EU member states that are part of the sample set. The level of economic integration increases as a value approaches the maximum value estimated. For the data belonging to EU proportion the normalization is slightly different. Here the intra-European trade in goods and services is measured with respect to a country's total trade in goods and services.

$$I_{i,t} = \frac{X_{i,t}^{EU}}{X_{i,t}^{Total}} * 100$$

Again it is the case that an increasing value corresponds with a higher level of economic integration, since a higher level of intra-European trade leads to higher integration.

For the data belonging to EU homogeneity, all the indicators are calculated in relation to the respective EU average according to the following formula:

$$I_{i,t} = \left(1 - \frac{\left| X_{i,t} - X_{\emptyset,t} \right|}{\left| \max(X_{J,T} - X_{\emptyset,T} \right|} \right) * 100$$

$X_{\emptyset,t}$ reflects the average value of the EU countries at period *t*, so that the numerator gives the difference between a country's value and the EU average. This reflects the level of heterogeneity between the respective country and the rest of the EU. The denominator represent the maximum difference estimated over the whole sample period and therefore reflects the maximum level of heterogeneity. Overall the fraction measures the relative heterogeneity and by subtracting this value from 1 the respective level of EU homogeneity is obtained.

In order to measure the level of EU symmetry, the indicators are measured in pairwise correlation to the respective EU average of the remaining sample countries. The correlation takes into account the values of the actual observed year and its four proceeding observations. In this case, a correlation of 1 represents the highest possible level of EEI.

$$I_{i,t} = corr\left(X_{i,\tau}, X_{\emptyset,\tau}\right) * 100$$

4.1.3 Weighting procedure

Before all the normalized values can be entered into the EU index, they should be measured according to their statistical relevance with respect to economic integration. Since this index differs from the index constructed by König and Ohr in that it contains not exactly the same

indicators, modifications to their weighting scheme is necessary. König and Ohr based their weighting scheme on the principal component analysis (PCA). PCA is a technique that is used to bring out strong patterns in datasets and to emphasize variation in the data. This multivariate analysis is an appropriate weighting and aggregation technique that employs data as extensively as possible. König and Ohr allow for correlations between the different factors, which takes the nature of the index variables in a more realistic manner into account. See König and Ohr (2012) for the full description of their weighting method. In accordance with the techniques used they obtained the weighting scheme presented in appendix 2.

For this research, I adjusted the weighting scheme in three different ways in order to test different models. For the first model the weighting scheme from König and Ohr is taken as the baseline and adjusted on the basis of the present indicators in the EU index used in this paper. For the second model a new principal component analysis is performed that relies on the actual data used. A third model is added in which equal weights are used.

Weights on the basis of König and Ohr

In order to obtain a new weighting scheme, adjustments are made to the weighting scheme presented in table 2 of appendix 2. Since in this paper institutional conformity is not part of the EU index, this weight of 22% is redistributed over the three other categories. I choose to distribute the weights in proportion to the initial weights of the categories. Additionally some modifications are made in the remaining indices. Since the subcategory EU proportion now captures only one indicator, part of the weight is shifted to EU openness. The amount that will be shifted is calculated on the basis of the number of indicators. EU homogeneity now contains five indicators whereas in the weighting scheme of König and Ohr it contained seven. Capital tax rate and consumer tax rate, including their accompanying weights are aggregated into tax rate on income and wealth, and the weight of the labour costs is redistributed proportionately to the initial weights. In the EU symmetry category no changes have been made so these weights stay the same. The above modifications lead to the weighting scheme presented in table 3 of appendix 2. The final weights are presented in the second column of table 2.

Weights on the basis of PCA

For the second method I make us of the PCA. The PCA method can be used to group individual indicators on the basis of their degree of correlation. Weights can only be estimated by this method if there exists sufficient correlation between the indicators. A correlogram of the indicators is presented in appendix 3. From this table it can be seen that there are not many

indicators that are highly correlated with each other. This can cause problems since with low correlations nearly as many factors as variables are required for factor analysis, defeating its aim of data reduction. Especially since the amount of indicators is larger than the amount of years included in the sample, using PCA to obtain a weighting scheme might be not very reliable and therefore the results should be interpreted with high caution (OECD, 2008).

Table 7 in appendix 3 presents the eigenvalues of the correlation matrix of the 13 indicators that together comprise EEI. The first five principal components explain 57.68% of the variance in the data set, whereas the last four together only explain 10.32% of the variance. There are different methods to determine how many factors should be retained in the analysis without losing too much information. I choose to use the Kaiser criterion, which drops all factors with an eigenvalue of below 1.0. The justification for this criterion is that adding a factor that explains less variance than is contained in one individual factor does not make any sense. The eigenvalues of component 6 is the first value below 1.0 and therefore five factors should be retained in the PCA. Since the correlations among the indicators is low, 42.32% of the variance remains unexplained, something that should be kept in mind when interpreting the output. To enhance the interpretability of the results it is necessary to rotate the factor loadings (OECD, 2008). I choose to rotate by using oblique promax rotation. This method allows for correlations among the indicators, and so the nature of the index variables are taken into account in a more realistic manner (Köning & Ohr, 2012). After rotation of the factor loadings, the weight of the indicators can be obtained by multiplying the squared rotated factor loading by the share of variance of the accompanying component. The results are presented in table 8 of appendix 3. In order to obtain the final weights of each indicator in its factor the values are scaled to unity (OECD, 2008). Table 4 in appendix 2 presents the total weighting scheme and the final weights are presented in column 3 of table 2 below.

Table 2: Final weights for the different weighting methods

Indicator	**1. König & Ohr**	**2. PCA**	**3.Equal**	**4.Tailored**
Trade Openness	16.3	6.62	7.69	16.80
In- and outward FDI	8.6	9.41	7.69	0.00
Employment by foreign country	8.3	3.67	7.69	7.20
Trade proportion	18.1	12.41	7.69	16.00
GDP per capita	5.8	13.06	7.69	17.50
Purchasing power standards	7.2	13.97	7.69	7.50
Public debt ratio	6.2	2.97	7.69	0.00
Tax rate on income and wealth	8.3	13.94	7.69	0.00

Long term interest rate	0.7	6.36	7.69	0.00
Economic growth	6.0	3.65	7.69	15.75
Inflation	6.6	2.34	7.69	10.50
Delta unemployment	2.7	7.59	7.69	8.75
Net borrowing	5.3	4.01	7.69	0.00

Source: Author's calculations

As can be seen from the tables from appendix 2, performing PCA does not lead to the same clusters as in the paper of König and Ohr. Whereas they categorized all variables into four components, five components are needed in this case and different variables are clustered together. A possible explanation could be that since the amount of indicators is lower and the obtained correlations are lower as well, it is more difficult to cluster the indicators into components. More components are needed to cluster the data. Because of the low reliability of the PCA in this paper, a third model will be added in which equal weights are used. Theory states that with low correlations it is sometimes better to use equal weights for all the indicators (OECD, 2008).

Using the final weights presented in table 2 enables to weigh all the different indicators of the EU index and to obtain final values for the level of EEI for each country and for each time period. The results for the first three methods are presented in appendix 4. The fourth weighting method, based on tailored weights, will be discussed later.

4.1.4 Additional variables

LCC

The constructed EU index determines the level of EEI which is the dependent variable of the model. The key independent variable is the variable that captures the level of LCC activity. The main variable of interest is therefore the LCC capacity. Data on LCC capacity is obtained from CAPA and is expressed as the international LCC capacity share (%) of total seats. Two varieties of the LCC data will be used: first the original LCC capacity share (%) of total seats will be used. In a second model the absolute number of LCC passengers will be used, which is obtained by multiplying the capacity share by the annual number of air passenger transport by reporting country. Unfortunately the data on air passenger transport by reporting county was only limited available for Greece and Poland. Therefore these two countries need to be removed from the sample when using the absolute number of LCC passengers as explanatory variable.

Euro membership

Since part of the objective of this paper is to compare the effect of LCCs on EEI with the effect of the Euro, the euro should be added to the model. Several studies elaborate on the importance of the Euro as a determinant of EEI. According to theory, the adoption of the Euro has stimulated economic integration by reducing the cost of information, enhancing price transparency and eliminating the exchange rate risk. These elements foster the movements of goods, people and capital (Trichet, 2007). However, some disagree and state that the Euro did not foster integration on all aspects. For example, Bekaert e.a. (2010) state that equity market integration is stimulated by EU membership, but that it is independent of the adoption of the Euro. He even states that the adoption, as well as the anticipation of the Euro did have minimal effect on market integration (Bekaert, Harvey, Lundblad, & Siegel, 2010). Adding the Euro to the explanatory variables will test whether there is a significant effect present and if the Euro positively influenced EEI. The Euro variable is expressed as a dummy where the value of 0 means the country did not join the Euro zone at that moment, whereas the value 1 represents Eurozone membership.

Schengen area

The treaty of Schengen is an agreement among European countries that enables the free movement of people. It entitles every EU citizen to travel, work and live in any EU country without special formalities. There are some countries that belong to the EU but did not join the Schengen area and vice versa. Since it is expected that being part of the Schengen area fosters EEI, this variable is an important element to the model (European Commission, 2016). This variable is also expressed as a dummy where the value of 0 means a country did not join the Schengen area at a certain moment, whereas the value 1 represents that a country belongs to the Schengen area.

Unfortunately it is not possible to include more explanatory variables to the equation since all variables that would make sense on an economic basis are already included into the EU index. Adding those variables to the explanatory part as well would cause serious endogeneity problems.

4.2 Methodology

The null hypothesis that will be tested states that the effect of low cost carrier capacity on EEI is positive and significantly different from zero. The alternative hypothesis is that there is no significant effect. The effect will be compared with the effect of Euro in order to determine whether the statement of Burghouwt that the effect of the low cost airlines on the EEI is at

stronger presence than the effect of the Euro is true. The empirical model consists of a panel data analysis with balanced panel data. In order to control for exogenous shocks in time that affect the different countries in the same way I use period fixed effects. Since I am interested in the impact of the variables over time I use cross section fixed effects as well: fixed effects remove the effect of time-invariant characteristics of countries in order to be able to assess the net effect of the predictors on the dependent variable (Torres-Reyna, 2007). The model based on LCC capacity share is represented by the following formula:

$$EEI_{i,t} = \alpha_i + \beta_1 LCC_{i.t} + \beta_2 EUR_{i.t} + \beta_3 SCH_{i.t} + u_{i,t}$$

Where α_i (i = 1, 2, ..., N) are fixed unknown constants that capture all (un)observable time-invariant differences across individuals and the term $u_{i,t}$ is the error term, assumed to be uncorrelated over time (Verbeek, 2012). The subscript *i* captures the different countries that are represented in our sample, whereas the subscript *t* captures the different time periods. I also test for serial correlation, which is likely to be present in panel data. When regressing the residuals of a simple panel least squares regression on its lags, some significant results are obtained, indicating that there is some serial correlation. Therefore, the white diagonal covariance method should be used (Reed, 2009).

In order to test whether the estimation output differs when the effect of the actual number of low cost passengers is used instead of a capacity share, a second equation is estimated. In order to correct for the overall growth in the air transport market the absolute number of air passenger transport is added to the explanatory variables as well. The model is represented by the following formula:

$$EEI_{i,t} = \alpha_i + \beta_1 \Delta\log(LCP_{i.t}) + \beta_2 EUR_{i.t} + \beta_3 SCH_{i.t} + \beta_4 \Delta\log(AIRT_{i.t}) + u_{i,t}$$

Where LCP stands for the low cost carrier passengers and AIRT represents the total number of air passenger transport. Both values are transformed into their logarithmic forms in order to get comparable data. Because of the non-stationarity of the variables the first differences are included into the equation. The estimation method stays the same and again cross section- and period fixed effects are used, together with the white diagonal coefficient covariance method. As mentioned before, due to the necessary exclusion of Greece and Poland this model is based on a smaller sample (N = 11). In order to be consistent and to check for possible differences, the first model based on LCC capacity share will also be re-estimated for the sample that excludes Greece and Poland.

5. Results

5.1 Estimation output

Table 3 presents the regression results for the panel least squares models with cross section and period fixed effects and the white diagonal coefficient covariance method. The upper- and lower part present the output for the models based on LCC capacity share, whereas the middle part presents the output for the models based on absolute passenger numbers. The different columns reflect the different weighting methods that are used. The final column presents the output for the models based on a weighting scheme with weights tailored towards LCC movements. This weighting method and the accompanying output will be discussed in the robustness section. The numbers between brackets present the standard errors and the level of significance is indicated by the asterisks.

Table 3: Regression output panel least squares: Cross section- and period fixed effects

		König & Ohr weights	PCA weights	Equal weights	Tailored weights
LCC Capacity share	**LCC**	-0.05(0.04)	-0.05(0.04)	-0.07(0.05)	-0.16(0.07)**
	Euro	3.30((0.97)***	2.56(0.85)***	3.14(1.15)***	4.16(1.94)**
	Schengen	0.77(1.04)	2.19(0.97)**	1.13(0.87)	3.23(2.02)
Absolute LCC passenger transport	**LCP**	-0.47(0.26)*	-0.59(0.22)***	-0.74(0.26)***	0.26(0.43)
	Euro	1.46(1.02)	0.85(0.80)	0.69(1.20)	1.18(2.13)
	Schengen	-0.25(1.50)	-0.62(1.23)	-0.31(1.78)	2.75(2.51)
	Air transport	-2.82(2.87)	-7.92(2.59)***	-4.11(3.22)	-6.28(4.56)
LCC capacity share (excl. Greece & Poland)	**LCC**	0.00 (0.05)	0.00(0.04)	0.00 (0.05)	-0.09 (0.09)
	Euro	2.26(1.10)**	1.59(0.91)*	1.61(1.26)	1.58 (1.93)
	Schengen	1.43(1.24)	2.23(1.14)*	1.90(1.48)	6.15(2.00)***

= significant at 10% level, **= significant at 5% level, *= significant at 1% level*

The first three models based on LCC capacity share deliver a negative and insignificant result for the effect of the LCC capacity share. The null hypothesis that the coefficient for the LCC capacity is significantly different from zero and positive can therefore be rejected. The negative sign is against the expectations and not in line with the discussed theory about a positive role for low cost airlines. However, the coefficient is insignificant so the effect is statistically not

different from zero. Contrary, the coefficient of the Euro is strongly significant and positive, which is not a surprising effect and makes sense from a theoretical perspective. Therefore, when using the LCC capacity share as the explanatory variable, the statement of Burghouwt that the effect of the LCCs has had a stronger impact on the level of EEI than the Euro turns out not to be true: Joining the Eurozone leads on average to an increase in the level of EEI while no impact of LCCs can be estimated. The coefficient of the Schengen treaty is positive and insignificant. The positive sign is in line with the expectations and theory, but since the coefficient is insignificant the variable does in this model not have a real effect on EEI.

When looking at the models based on the absolute number of LCC passengers, the results are different. The first three models all deliver a negative and significant coefficient for the absolute number of LCC passengers. The null hypothesis can again be rejected since an increase in the amount of passengers travelling by low cost air transport now leads to a decrease in the level of EEI. This result is in sharp contrast with the discussed theory. The effect of the overall air passenger transport market is insignificant in the models with equal weights and weights based on König & Ohr. The model with weights based on PCA delivers a significantly negative coefficient, which is not in line with earlier discussed theory that air transport fosters realising deeper integration (Mūller-Jentsch, 2003). An interesting finding is that although the coefficient remains positive, the effect of the Euro is now insignificant. This means that when using LCC passenger numbers instead of LCC capacity share, the Euro loses its explaining power and its significance. However, the statement of Burghouwt and the hypothesis of this research remains invalid: the effect of the LCCs is now at stronger presence than the effect of the Euro, but the direction of the effect is not in accordance with the hypothesis. The coefficient for Schengen remains insignificant, concluding that being part of the Schengen area does not result in a measurable effect on the level of EEI. The coefficient for the Schengen area is insignificant in all three cases, where it was insignificant in 2 of the 3 cases in the first set of models as well. This can possibly be explained by the limited, indirect role it has in determining the level of EEI. As explained before, being part of the Schengen area allows for free movement of people. Although it is straightforward that the free movement of people increases mobility and therefore has a positive impact on EEI, there needs to be a mechanism in between that enables the people to actually move between the countries. The rule to move freely needs to be supported by actual means of transport in order to have its real effect on EEI. The fact that in this paper the effect of participation in the Schengen treaty on EEI is measured directly, can cause the coefficient to be insignificant since now the effect is weaker. The fact that the coefficient is significant in the

model based on PCA weights can be attributed to the distribution of the weights in this method. However, as earlier discussed, this method is not fully reliable and should therefore be taken into account with high caution.

In both sets of models the results do not change much when adjustments in the weighting schemes are made. Therefore, the results are not strongly dependent on the weighting method used. However, the output of the different sets of models is different. For the models based on absolute passenger numbers the sample was reduced and Greece and Poland were excluded. To see if the removal of these countries causes the difference in outcomes, a third set of models is tested. This set uses LCC capacity share as explanatory variable, but it excludes Greece and Poland from the sample. These results are presented in the lower part of table 3. Just as in the first set of models no significant coefficients for the LCC capacity are obtained. The coefficients for the Schengen area stay insignificant in the König & Ohr and equal weights model and the only difference is in the third model based on equal weights. Here the coefficient for the Euro loses its significance in the case of removal of Greece and Portugal. Overall the results do not deliver any important differences with the models that do include Greece and Poland. Concluding that the removal of these countries does not cause the difference in estimation output between the first and second set of models.

Before turning to what actually could explain this difference, it is important to first understand how a negative coefficient can be justified. Although the coefficients are insignificant, the sign for the LCC capacity share is negative in the first set of models. When using absolute numbers of LCC passenger transport this negative sign becomes significant. An explanation for a negative coefficient could be because of a trade-off between increased tourism and decreased international trade as the effect of an increase in LCC capacity. Low cost airline transport is closely related to tourism and most cities experience a boost in tourism as an effect of the launch of LCC flights. LCCs operate mainly through launching new routes to destinations which were not available before, or by launching routes to destinations for which legacy carriers demanded high fares. The boost in tourism demand is at larger presence in East European countries compared to West European countries since the latter already have well-developed and strong tourism bases (Rost, Kruger, & Van den Brande, 2006). Since many East European countries experiences strong increases in the LCC capacity share, these countries see their tourism demand increasing. From standard economic theory we know that countries that are well endowed with tourism often perform worse on indicators related to the imports and exports of goods. These countries do not focus on tradeable goods and on production industries, but rather

have their economies focused on national services in order to respond to the tourism demand. For illustration, in 2014 the Netherlands had an export level equal to 82.9% of GDP, whereas Greece, a country characterized by high tourism demand, had an export level equal to only 32.7% of GDP. When looking at tourism, only 80 tourists per 100 inhabitants visit the Netherlands annually, where Greece receives over 200 tourists per 100 inhabitants annually (World DataBank, 2016). Indicators related to the imports and exports of goods are reflected in the EU index and determine the level of EEI. Therefore, if the increase in tourism demand causes a decrease in trade related indicators, it negatively affects several elements of the EU index, indirectly causing the level of EEI to decline. This explains why a negative coefficient is established and the same theory could serve as the explanation for a negative coefficient for total air transport in the models based on absolute numbers. As stated before, a negative coefficient for overall air passenger transport is not in line with the earlier discussed theory that air transport fosters realising deeper integration. However, the positive tourism effect which negatively affects EEI also explains the negative coefficient for the overall air passenger transport market. At first instance this would not serve as the appropriate explanation since it is mainly low cost transport that causes increases in tourism, and not legacy transport. However, since the effect of the overall air transport market is measured in first differences, the negative effects are the largest for countries that experience the biggest increases in overall air transport. These countries that experienced the sharpest increases in overall air transport are the countries that often did not have well established air transport networks before. The increase in air transport is for these countries for a large part determined by an increase in LCC activity. The introduction of the low cost airlines generated and stimulated air transport activity and therefore it is because of the increase in LCC activity that the overall air passenger transport increased. Because of the increasing LCC activity, the inflow of tourism is realised and the negative effect on EEI is established, resulting in a negative coefficient for overall air passenger transport.

When the models are based on absolute LCC passenger numbers, the negative coefficient for LCC capacity suddenly becomes significant. This difference could possibly be explained by some measurement problems that are present when the data is expressed as a capacity share. Some countries are characterized by lower shares of LCC capacity since they have an international hub airport that ensures many legacy flights. For example, the Netherlands has Schiphol Airport, which is internationally an important airport providing a high legacy airline capacity in the Netherlands. Therefore, no matter how hard the LCC capacity will increase in the Netherlands, its capacity share will stay lower than in countries that do not have an

international hub airport providing many legacy flights. This could cause problems in the estimation of the true effect of an increase in LCC activity on the level of EEI. Now an increase in LCC activity has a limited effect since countries well-endowed with legacy capacity experience less sharp increases in their capacity share. The effect is now restricted to countries that did not have well established air transport networks before. When measuring the low cost activity in absolute numbers the true effect of low cost activity can be estimated more accurately. The effect for the countries with a well-established (legacy) air transport network is better measurable and therefore the total effect is at stronger presence than before. The negative effect is strengthened, which could cause the coefficient to become significant. The reason why the coefficient for the overall air passenger transport does not turn significant is because overall air passenger transport compared to low cost air transport has an indirect and a less fierce effect on tourism and therefore on EEI.

5.2 Robustness

The output in the last column of table 3 is determined by another adjustment in the weighting method. In order to test for robustness of the results, I decided to test two additional scenarios. In the first one, I decided to vary with the dependent variable EEI. In the second one a different method to measure EEI is explored, which allows to include more explanatory variables into the equation that determine EEI.

Tailored weighting scheme

I test if the estimation output differs if the level of EEI is determined by the use of tailored weights. In the first three analysis the level of EEI was determined with the use of the weights obtained by König & Ohr, by using PCA and with the use of equal weights. Now I test what happens if the weights of König & Ohr are taken as the baseline and more weight is shifted to the elements related more directly to the transport of people, since this is obviously what is realised by LCC capacity. Low cost air transport is mainly used for tourism and leisure, and since the index does not capture an element for tourism or the transport of people directly, I decided to focus on the indirect effects: people spend money abroad which has its effects on several components of the EU index. I decide to focus on the components where the effect is the most direct: GDP per capita, economic growth, inflation, purchasing power standards, employment by foreign country, the change in unemployment and the trade in (goods and) services. All other variables obtain zero weight in the EU index.

For the remaining categories the weights are redistributed. The category single market and EU symmetry now both contain 3 indicators that should be assigned a weight. The category EU homogeneity now only contains 2 indicators. Therefore I assign higher weights to single market and EU symmetry, with single market having the highest weight. This is since single market contains two indicators that reflect trade in services, which are to my believe important results from low cost activity. The weights in the indices are divided on the basis of importance. This is related to how direct the increase in LCC activity has its impact on the specific indicator. The final weights are presented in the last column of table 2. The complete weighting schedule can be found in table 5 of appendix 2.

Now the index is tailored to be more responsive to LCC capacity changes. Therefore the initial expectation is that the results for the estimation of the LCC capacity turn now (more) positive. The output is presented in the final column of table 3. The model based on LCC capacity share now delivers a negative and significant coefficient for LCC capacity share. The Euro stays positively significant and the Schengen remains insignificant. The model based on absolute LCC passenger numbers now delivers a coefficient for LCP activity that is not significantly different from zero. Overall, this model does not deliver any significant coefficients and therefore it fails to serve as an appropriate model to explain the level of EEI. In the third set of models, based on LCC capacity share but with the exclusion of Greece and Poland, the model with tailored weights does not deliver any significant variables for LCC capacity and the Euro either. The coefficient for Schengen is now positively significant. Contrary to the different weighting methods, with the use of tailored weights, excluding Greece and Poland leads to a difference in output. However, the exclusion does not lead to a significant coefficient and besides, the model with absolute numbers that excludes Greece and Poland as well does not have a significant coefficient for LCP either, whereas it had a positive coefficient with the other weighting methods discussed. Therefore, again I can conclude that exclusion of those countries does not cause any important and significant differences.

Although the results of the tailored models are not in line with the initial expectations and with the economic theory discussed in this paper, they are no full surprise either. In line with the possible explanations for a negative coefficient for LCC capacity share discussed earlier, it is not completely strange that this coefficient is now significantly negative. The index is now tailored to be more responsive to LCC movements, which stimulates the earlier discussed tourism effect and negatively affects trade elements covered in the EU index. Especially since now more weight is put on elements related to trade. Therefore, the negative effect on EEI is

strengthened and the coefficient become significant. Surprising is that this effect is not visible in the model based on absolute LCC numbers. However, as discussed before this model does not deliver any significant variables explaining the level of EEI. In the model based on LCC capacity share with the exclusion of Greece and Poland the only significant coefficient is for the Schengen treaty. This positive coefficient is in line with theory and can be explained by the fact that EEI is now tailored to be more responsive to transport. However, although some justifications for the obtained output can be found, the output of this robustness check is not in line with the initial expectations and with the theory highlighted in this paper. Furthermore the output of this robustness check is not consistent since when absolute numbers are used, the output changes. The insignificant LCP coefficient in the model based on absolute numbers and the fact that the model based on capacity share with the exclusion of Greece and Poland only delivers insignificant coefficients questions the reliability of the check and thus of the weighting method. This weighting method does not deliver robust results and the differences that are present cannot be explained by the exclusion of Greece and Poland or by the way of expressing LCC activity. Therefore I do not want to emphasize too much on these results.

Different method of measurement

The results obtained in table 3 are all dependent on different varieties of the EU index. As mentioned earlier, a disadvantage of the use of this index is the lack of the opportunity to include more explanatory variables. A different way to test the robustness of the results is to change the method of measurement of EEI. In this subsection I test what happens if one element of the EU index is taken as the proxy for EEI and the rest of the elements, together with the LCC capacity, Euro and Schengen variables are added to the explanatory part of the equation. For this part of the research I rely on a study of Andersen (2003) who argued that the main indicator for economic integration is product market integration. Since there is no direct variable available for product market integration I focus on the openness of a country, reflected by the imports and exports of goods and services. Therefore EU openness (EUO), reflected by imports and exports as percentage of total GDP, is used as a proxy for EEI. This variable, will now be used as the dependent variable of the model. The other 12 elements of the EU index will be used as explanatory variables. Two varieties are tested. In a first model, all the remaining 12 elements of the index will be used as explanatory variables (base model). In a second model, some variables that are expected to cause multicollinearity problems will be excluded, leaving a smaller number of variables to include into the equation (adjusted model). A correlogram of the variables shows that there is a high correlation between the variables net borrowing and public

debt ratio, between the variables purchasing power parity and GDP per capita and between purchasing power parity and taxes on income and wealth. To correct for this problem of multicollinearity, the variables public debt ratio and PPP are removed from the equation in the adjusted model. Furthermore the variables GDP per capita and economic growth are interrelated, and therefore GDP growth is excluded as well. The formula presented below is used for the base model with LCC capacity share as key independent variable, including the variables trade proportion (TP), in- and outward FDI as percentage of GDP (FDI), employment by foreign country (FEM), GDP per capita (GDPCAP), purchasing power parity (PPP), public debt (PD), tax rate on income and wealth (TAX), long-term interest rates (INT), economic growth (GDPG), inflation (INF), delta unemployment (UN) and government net borrowing (NBOR).

$$\begin{aligned} EUO_{i,t} = \ & \alpha_1 + \beta_1 LCC_{i.t} + \beta_2 EUR_{i.t} + \beta_3 SHC_{i.t} + \beta_4 \Delta TP_{i.t} + \beta_5 FDI_{i.t} + \beta_6 \Delta FEM_{i.t} \\ & + \beta_7 \Delta GDPCAP_{i.t} + \beta_8 \Delta PPP_{i.t} + \beta_9 \Delta PD_{i.t} + \beta_{10} \Delta TAX_{i.t} + \beta_{11} \Delta INT_{i.t} \\ & + \beta_{12} GDPG_{i.t} + \beta_{13} \Delta INF_{i.t} + \beta_{14} UN_{i.t} + \beta_{15} \Delta NBOR_{i.t} + u_{i,t} \end{aligned}$$

The base model with absolute LCC passenger numbers is presented by the following formula:

$$\begin{aligned} EUO_{i,t} = \ & \alpha_1 + \beta_1 \Delta \log(LCP_{i.t}) + \beta_2 EUR_{i.t} + \beta_3 SHC_{i.t} + \beta_4 \Delta \log(AIRT_{i.t}) + \beta_5 \Delta TP_{i.t} \\ & + \beta_6 FDI_{i.t} + \beta_7 \Delta FEM_{i.t} + \beta_8 \Delta GDPCAP_{i.t} + \beta_9 \Delta PPP_{i.t} + \beta_{10} \Delta PD_{i.t} \\ & + \beta_{11} \Delta TAX_{i.t} + \beta_{12} \Delta INT_{i.t} + \beta_{13} GDPG_{i.t} + \beta_{14} \Delta INF_{i.t} + \beta_{15} UN_{i.t} \\ & + \beta_{16} \Delta NBOR_{i.t} + u_{i,t} \end{aligned}$$

Performing unit root tests showed that the variables trade proportion, foreign employment, GDP per capita, PPP, public debt ratio, tax rate on income and wealth, long term interest rate, inflation and net borrowing have a unit root and are not stationary. Therefore these variables are transformed into their first differences. However, the dependent variable EUO is included in levels. Both the Levin, Lin & Chu test and the Breitung test reject the null hypothesis of a common unit root and therefore the variable is stationary across sections. Besides, the inclusion of cross section- and period fixed effects ensures the estimator to correspond to the fixed effects estimator, enabling to appropriately include the variable in levels (Verbeek, 2012). For the base model and for the adjusted model again the cross section fixed effects model should be used. By regressing the residuals of a simple panel least squares regression on its lags I test for serial correlation. Some significant results are obtained, indicating that there is some serial correlation. Therefore, again the white diagonal covariance method is used in the regression

analysis. To control for exogenous shocks over time, period fixed effects are included as well. The output for the different models is presented in table 4 below.

Table 4: Regression output panel least squares: Cross section- and period fixed effects

		Base model	Adjusted model	Base model excl. Greece & Poland	Adjusted model excl. Greece & Poland
Models based on LCC capacity share	**LCC**	-0.23(0.10)**	-0.24(0.11)**	-0.20(0.14)	-0.24(0.15)
	Euro	7.46(2.07)***	7.76(2.16)***	5.44(2.14)**	7.07(2.11)***
	Schengen	12.78(2.57)***	9.71(2.51)***	16.63(3.63)***	10.86(3.26)***
	Trade proportion	0.30(0.32)	0.12(0.35)	0.23(0.37)	0.06(0.39)
	In- and outward FDI as % of GDP	-0.01(0.04)	-0.00(0.05)	-0.00(0.05)	-0.01(0.05)
	Employment by foreign country	0.40(0.14)***	0.36(0.13)***	0.42(0.15)***	0.40(0.14)***
	GDP per capita	-0.00(0.00)***	-0.00(0.00)	-0.00(0.00)**	-0.00(0.00)
	PPP	-0.19(0.11)*	*N/A*	-0.25(0.15)*	*N/A*
	Public debt ratio	1.18(3.31)	*N/A*	0.05(7.75)	*N/A*
	Tax rate on income and wealth	0.53(0.55)	0.25(0.59)	0.16(0.59)	0.14(0.64)
	Long term interest rates	0.12(0.21)	-0.04(0.23)	0.00(0.37)	-0.29(0.41)
	Economic growth	1.20(0.26)	*N/A*	1.46(0.31)***	*N/A*
	Inflation	-0.81(0.27)	-0.84(0.28)***	-0.81(0.31)***	-0.90(0.30)***
	Delta unemployment	-0.00(0.03)	-0.08(0.04)*	0.02(0.04)	-0.07(0.05)
	Net borrowing	-1.26(3.33)	-0.10(0.10)	-0.17(7.73)	-0.17(0.12)
Models based on absolute LCC passenger transport	**LCP**	-0.12(0.75)	0.93(0.84)		
	Euro	4.61(2.45)*	7.09(2.48)***		
	Schengen	13.05(4.04)***	7.90(3.89)**		
	Air Transport	-16.95(9.34)*	-11.04(11.37)		
	Trade proportion	0.33(0.35)	0.04(0.40)		
	In- and outward FDI as % of GDP	-0.02(0.05)	-0.04(0.05)		
	Employment by foreign country	0.40(0.16)**	0.37(0.15)**		
	GDP per capita	-0.00(0.00)**	-0.00(0.00)		
	PPP	-0.29(0.15)*	*N/A*		
	Public debt ratio	3.36(8.45)	*N/A*		
	Tax rate on income and wealth	-0.03(0.62)	0.15(0.65)		
	Long term interest rates	-0.04(0.41)	-0.46(0.41)		
	Economic growth	1.63(0.35)***	*N/A*		
	Inflation	-0.57(0.29)	-0.75(0.30)**		
	Delta unemployment	0.02(0.04)	-0.08(0.05)		
	Net borrowing	-3.41(8.43)	-0.10(0.13)		

= significant at 10% level, **= significant at 5% level, *= significant at 1% level*

The first two models based on LCC capacity share deliver significant and negative coefficients for the LCC capacity. The effect of the Euro and Schengen is positive and significant in these models. When Poland and Greece are excluded the coefficient for LCC capacity remains negative but loses its significance. The Euro and Schengen remain positive in these models. The models based on absolute LCC passenger transport deliver negative but insignificant coefficients for LCC capacity. The coefficient for the overall air transport market is significantly negative in the base model. The Euro and Schengen are both significantly positive in both the base- and the adjusted model. When looking at the control variables of all models, it can be concluded that the control variables that are significant almost all have the expected sign according to theory. Exceptions are GDP per capita and PPP, which have a negative coefficient. However, in the adjusted model when economic growth is excluded, GDP per capita obtains a coefficient that is statistically not different from zero. Furthermore PPP is removed because of the multicollinearity problem. Of one variable the direction of the coefficient is ambiguous: inflation. In the adjusted model based on absolute LCC passenger numbers this coefficient is significantly negative. A negative coefficient could explain that (too) high inflation increases the difference with inflation levels of other countries and therefore the distance to full integration. Contrary, a positive coefficient could explain an increasing level of income and consumption that could foster the process of integration.

Overall, the output of the different weighting method is in line with the earlier obtained results. The signs for the coefficients of interests are consistent throughout the different models. However, where in the first models based on different weighting schemes the use of absolute LCC passenger numbers resulted in a significant LCC effect, it is now the use of LCC capacity share that delivers significant coefficients for LCC activity. One should keep in mind that EEI is now proxied by EU openness, the amount of intra-European trade in goods and services as percentage of total GDP. A different dependent variable is estimated and therefore differences in significance can occur. Since the signs of the coefficients are consistent there is no need to pay too much attention to this difference. The coefficients for the Euro and for the Schengen agreement are now positive and significant in all cases. The fact that the coefficient for Schengen is now significant can be explained by the fact that EEI is now proxied by trade openness. Since the Schengen agreement fosters the movement of people and therefore the movement of services, it has a more direct impact on the level of trade openness, resulting in a significant and positive effect. The negative coefficient for the overall air transport market is also consistent with earlier obtained results. The coefficient is only significant in the base

model, where in the earlier presented models it was only significant in the model based on PCA weights. The only remarkable finding of this robustness check is that now the exclusion of Greece and Poland causes the LCC capacity share to lose its significance. The models based on absolute numbers that exclude Greece and Poland as well do not deliver a significant coefficient for LCP either. This suggests that the exclusion of these countries can cause differences in the estimation output. However, since the sign remains negative and the signs and significance of the other variables of interest remain the same I conclude that the removal of these countries does not result in any important differences for the overall output.

In summary, this section has presented eighteen different models that estimated the effect of LCC capacity on the level of EEI. In the initial models based on the share of LCC capacity, mainly insignificant effects are found for the LCC capacity share, with the exception of the model that tests the robustness by using tailored weights. This model delivers a significantly negative coefficient. The robustness check that uses EU openness as a proxy for EEI leads to negative and significant coefficients. The coefficient for the Euro is positively significant in both the initial models and the robustness checks. Therefore, on the basis of the models with LCC capacity expressed as a share, it can be concluded that the effect of the low cost airlines on the level of EEI has not been at stronger presence than the effect of the Euro. Instead, the Euro has a significantly positive effect, whereas the LCC capacity has a negative or insignificant effect. As discussed before, expressing the low cost activity as a capacity share can cause some measurement problems and is disadvantageous for countries well-endowed with legacy airlines. Therefore I assume the results of the models that expressed the low cost activity by absolute LCC passenger numbers to be more reliable and I believe they estimate the true effect of an increase in LCC activity better. When the absolute number of LCC passenger transport is used, negative and significant coefficients are found in the initial models with weighting schemes on the basis of König & Ohr, PCA and equal weights. The coefficient for the Euro is not significant in these models. When these results are tested for robustness by using tailored weights or a different measurement method, no significant coefficients for LCP are found. The effect of the euro is significantly positive in all robustness check models. Therefore, on the basis of the models with absolute LCC numbers, the effect of the LCCs is again not at stronger presence than the effect of the Euro. The effect is rather insignificant or negative, while the effect of the Euro is mainly significantly positive. Overall, the results are quite robust and the differences in estimation results between LCC capacity share and absolute numbers cannot be explained by the removal of Greece and Poland from the sample.

5.3 Limitations and recommendations

The different (sets of) models in this paper are characterized by some limitations. First of all, an important limitation of this research is that it was not possible to include all EU countries into the sample set. Only 13 out of the current 28 EU countries could be included. For the models based on absolute LCC passenger numbers the sample was even smaller: Due to the limited data availability Greece and Poland needed to be excluded. Besides, the limited data on LCC capacity share was only available for the period 2003-2014, restricting the included time period. Including a bigger time period and a more complete set of countries would definitely have improved the quality of the estimation results.

A second important limitation is the complexity of measuring EEI. Since there is not one perfect way to exactly measure the level of economic integration an index has been constructed that enables to combine several aspects into one aggregate measure. Although the justification of this index is quite strong, using this index as a dependent variable removes the ability to include elements of it as explanatory variables. This weakens the empirical model since now only little explanatory variables are tested. Besides, the quality of the EU index can be improved if more relevant indicators can be included into the index and if the weighting method can be optimized. A current drawback in the construction of the EU index is the weighting method. Because the amount of indicators is smaller than the time period and since the correlations among the indicators is relatively low, using the PCA is not a very reliable way to obtain components and to assign weights to these components and their corresponding indicators. Although the results have shown that the output is not very dependent on the selected weighting scheme, I believe that more indicators and an improved corresponding weighting scheme could improve the quality and reliability of the estimation output.

For future research I would recommend to include a larger time period and more countries. If enough countries can be included it is also possible to split the sample and to test for possible differences in estimation output if the sample is divided on the basis of the level of tourism of a country. This was not currently not possible since the amount of cross-sections was too low. For the measurement of EEI I believe an index is the only method that allows to take different elements appropriately into account, which is necessary to cover the complexity of the concept of EEI. To improve the EU index, more (relevant) indicators should be taken into account and the weighting method should be improved. Besides, I would suggest to solely use data on

absolute passenger numbers and not on capacity shares, since I believe the first estimates the true effect more accurately.

6. Conclusion

The aim of this research is to test the hypothesis that the low cost airlines have a positive and significant effect on the level of EEI and that this effect is at stronger presence than the effect of the Euro. On the basis of the obtained results in this paper this hypothesis appears not to be true.

This research shows that although the European Union is currently in the fifth stage of integration, there a many heterogeneities among its Member States and many argue about their actual state of integration. Economic integration is not a dynamic element, but rather a concept that is hard to measure. In this paper economic integration is compared with globalization, which is a more dynamic and measurable element. By comparing EEI with globalization it is possible to construct an EU index based on an earlier developed EU index by König and Ohr (2012). Several varieties of this EU index are used as the dependent variable and it appears that the output is not strongly dependent on the weighting method used. However, what appears to be important for the estimation output is the way the LCC activity is expressed. When LCC activity is expressed as a capacity share, its effect is insignificant in the initial models. When robustness checks are performed the effect of LCC capacity share becomes significantly negative. When using absolute numbers on LCC activity the coefficients in the initial models are negative as well, but also significant. Contrary, the coefficients lose their significance with the robustness checks. The effect of the Euro is always positive, and significantly positive in the majority of the models. Therefore the statement of Burghouwt and the hypothesis of this research turns out not to be true. The increase in low cost activity does not lead to more integration, but it causes an increase in tourism demand which comes at the cost of international trade. Countries focus now more on national services in order to respond to tourism demand instead of a focus on tradeable goods and production industries. Since the latter determine the level of EEI, an increase in low cost activity leads in this research to a decrease in the level of European economic integration.

The previous section has shown that there are a few important limitations to this research which weaken the reliability of the results. Therefore the results and the conclusion of this research should be interpreted with high caution and future research is recommended.

Appendix 1

Table 1: Data sources

Variable	Description	Source
LCC capacity share	% share of annual seat capacity	CAPA
Air passenger transport	Total annual passengers on board by reporting country	Eurostat
Euro	1 if country joins Euro, 0 otherwise	European commission
Schengen	1 if country joins Schengen, 0 otherwise	European commission
Trade openness	Intra EU trade in goods and services in % of total GDP	Eurostat
Trade proportion	Intra EU trade in goods and services % of total trade	Eurostat
FDI	In- and outward FDI as % of GDP	UNCTAD
Employment by foreign country	activity rate by foreign country	Eurostat
GDP/CAP	GDP per capita	Eurostat
PPP	Comparable price levels of final consumption by households including indirect taxes	Eurostat
Public debt ratio	Government deficit – surplus as % of GDP	Eurostat
Taxes	Tax rate on income and wealth	Eurostat
Long term interest rates	Long term government bond yield (10 year maturity)	Eurostat
Economic growth	GDP growth, in % change to previous year	WorldBank
Inflation	CPI, 2005 = 100	UNCTAD
Delta unemployment	% change in total unemployment (in % of total labour force)	WorldBank
Net borrowing	Government deficit	Eurostat

Appendix 2

Table 2: Weighting scheme obtained by König and Ohr (2012)

Indices	Sub-indices	Indicators	Weight in indices (%)	Weight in total index (%)
Single market (40%)	*EU openness (56%)*	Goods	33	7.2
		Services	16	3.6
		Capital	27	5.9
		Labour	25	5.4
	EU proportion (44%)	Goods	29	5.2
		Services	31	5.5
		Capital	11	1.9
		Labour	28	5.0
EU Homogeneity (22%)		GDP per capita	17	3.8
		PPP	21	4.8
		Labour costs	18	3.9
		Long term interest rates	2	0.5
		Public debt ratio	18	4.0
		Consumer tax rate	20	4.5
		Capital tax rate	4	0.8
EU symmetry (16%)		Economic growth	29	4.6
		Inflation	32	5.0
		Delta unemployment	13	2.0
		Net borrowing	26	4.0
Institutional conformity (22%)	EU participation (33%)	EMU membership	64	4.7
		Schengen participation	36	2.7
	EU compliance (67%)	Infringement proceedings	20	3.0
		ECJ verdict: single market	38	5.7
		ECJ verdict: environment and consumer	19	2.9
		ECJ verdict: other sectors	23	3.4

Source: (Köning & Ohr, 2012)

Table 3: Weighting scheme on the basis of the weights from König and Ohr (2012)

Indices	Sub-indices	Indicators	Weight in indices (%)	Weight in total index (%)
Single market	*EU openness*			
(51.3%)	*(64.8%)*	Trade openness	49	16.3
		In- and outward FDI as % of GDP	26	8.6
		Employment by foreign country	25	8.3
	EU proportion			
	(35.2%)	Trade proportion	100	18.1
EU Homogeneity		GDP per capita	20.7	5.8
(28.2%)		PPP	25.6	7.2
		Public debt ratio	22.0	6.2
		Tax rate on income and wealth	29.3	8.3
		Long term interest rates	2.4	0.7
EU symmetry		Economic growth	29	6.0
(20.51%)		Inflation	32	6.6
		Delta unemployment	13	2.7
		Net borrowing	26	5.3

Source: Author's calculations

Table 4: Weighting scheme on the basis of PCA

Indices	Indicators	Weight in Factors (%)	Weight in total index (%)
PC 1 (33%)	PPP	42.35	13.97
	Trade openness	20.06	6.62
	Trade proportion	37.59	12.41
PC 2 (27%)	GDP per capita	48.37	13.06
	Tax rate on income and wealth	51.63	13.94
PC 3 (17%)	In- and outward FDI as % of GDP	55.34	9.41
	Net borrowing	44.66	7.59
PC 4 (13%)	Employment by foreign country	28.26	3.67
	Long term interest rates	48.89	6.36
	Public debt ratio	22.85	2.97
PC 5 (10%)	Economic growth	36.50	3.65
	Inflation	23.39	2.34
	Delta unemployment	40.11	4.01

Source: Author's calculations

Table 5: Weighting scheme with tailored weights

Indices	Sub-indices	Indicators	Weight in indices (%)	Weight in total index (%)
Single market	*EU openness*			
(40%)	*(60%)*	Trade openness	70	*16.80*
		In- and outward FDI as % of GDP	0	*0.00*
		Employment by foreign country	30	*7.20*
	EU proportion			
	(40%)	Trade proportion	100	*16.00*
EU Homogeneity		GDP per capita	70	*17.50*
(25%)		PPP	30	*7.50*
		Public debt ratio	0	*0.00*
		Tax rate on income and wealth	0	*0.00*
		Long term interest rates	0	*0.00*
EU symmetry		Economic growth	45	*15.75*
(35%)		Inflation	30	*10.50*
		Delta unemployment	25	*8.75*
		Net borrowing	0	*0.00*

Source: Author's calculations

Appendix 3

Table 6 : Correlogram of all indicators

	Trade openness	FDI as % of GDP	Foreign employment	Trade proportion	GDP per capita	PPP	Public debt ratio	Taxes	Long term interest	GDP growth	Inflation	Delta unemployment	Net borrowing
Trade openness	1.00	**0.19**	**0.17**	**0.41**	**-0.19**	**-0.39**	0.08	**0.23**	**-0.36**	0.05	0.01	0.02	-0.08
FDI as % of GDP		1.00	0.03	0.04	-0.04	0.12	0.04	0.14	-0.10	-0.05	**-0.23**	**-0.21**	**-0.38**
Foreign employment			1.00	0.07	**0.39**	0.15	-0.07	0.09	**-0.16**	-0.01	0.08	-0.08	-0.02
Trade proportion				1.00	**-0.19**	**-0.54**	0.14	**-0.17**	-0.07	-0.00	-0.13	-0.01	-0.09
GDP per capita					1.00	**-0.16**	0.07	**0.58**	0.10	0.14	0.05	**-0.18**	0.08
PPP						1.00	**-0.21**	**-0.36**	**0.22**	**0.19**	0.10	**0.19**	**-0.18**
Public debt ratio							1.00	**0.20**	**0.20**	0.02	-0.03	-0.08	0.05
Taxes								1.00	0.02	-0.13	-0.05	**-0.20**	-0.04
Long term interest									1.00	0.07	-0.11	0.07	0.01
GDP growth										1.00	**0.24**	**0.41**	-0.04
Inflation											1.00	**0.32**	**0.17**
Delta unemployment												1.00	0.12
Net borrowing													1.00

**Marked values are correlations that are statistically significant at the 95% confidence level*

Table 7: Eigenvalues and percentage of variance explained per component

PC	Eigenvalue	% of variance	Cumulative %
1	2.374298	0.1826	0.1826
2	1.977748	0.1521	0.3348
3	1.723131	0.1325	0.4673
4	1.423276	0.1095	0.5768
5	1.265202	0.0973	0.6741
6	0.928464	0.0714	0.7455
7	0.740976	0.0570	0.8025
8	0.648695	0.0499	0.8524
9	0.576085	0.0443	0.8968
10	0.499033	0.0384	0.9351
11	0.470142	0.0362	0.9713
12	0.213168	0.0164	0.9877
13	0.159782	0.0123	1.0000

Table 8: Rotated factor loadings

	Rotated factor loadings					Weighting of the indicator [a]				
	F1	**F2**	**F3**	**F4**	**F5**	**F1**	**F2**	**F3**	**F4**	**F5**
Foreign employment	0.04	0.28	-0.02	-0.41	0.01	0.00	0.02	0.00	**0.02**	0.00
FDI as % of GDP	-0.07	0.07	0.61	-0.04	-0.13	0.00	0.00	**0.06**	0.00	0.00
GDP per capita	-0.18	0.78	-0.12	-0.07	-0.07	0.01	**0.16**	0.00	0.00	0.00
Economic growth	-0.04	-0.02	0.05	0.09	0.55	0.00	0.00	0.00	0.00	**0.03**
Inflation	-0.07	0.09	-0.24	-0.15	0.44	0.00	0.00	0.01	0.00	**0.02**
Long term interest	-0.15	0.08	-0.07	0.54	0.04	0.01	0.00	0.00	**0.04**	0.00
Net borrowing	0.12	0.01	-0.55	0.00	0.06	0.00	0.00	**0.05**	0.00	0.00
PPP	-0.80	-0.19	0.27	0.02	0.16	**0.21**	0.01	0.01	0.00	0.00
Public debt ratio	0.27	0.19	0.01	0.37	0.06	0.02	0.01	0.00	**0.02**	0.00
Taxes	0.14	0.80	0.19	0.14	0.05	0.01	**0.17**	0.01	0.00	0.00
Trade openness	0.55	0.06	0.26	-0.21	0.21	**0.10**	0.00	0.01	0.01	0.00
Trade proportion	0.75	-0.33	0.00	0.07	-0.04	**0.19**	0.03	0.00	0.00	0.00
Delta unemployment	-0.03	-0.11	-0.16	0.05	0.58	0.00	0.00	0.00	0.00	**0.03**
Explained variance	*1.86*	*1.55*	*1.03*	*0.76*	*0.56*					
Explained / total	*0.33*	*0.27*	*0.17*	*0.13*	*0.10*					

[a] Values are obtained by multiplying the squared rotated factor loading with the share of variance of the corresponding component.

Appendix 4

Table 9: Level of EEI per country per year from 2003-2014 on the basis of König and Ohr weights

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cyprus	57.4	61.1	63.3	62.8	63.0	66.6	70.8	67.5	71.6	65.1	71.7	64.5
Denmark	40.5	41.7	40.5	42.6	37.8	42.9	47.6	45.9	47.6	47.9	47.5	43.5
Estonia	57.6	63.4	67.6	64.9	65.3	69.6	68.2	67.6	68.0	69.9	69.3	64.2
France	55.1	58.9	55.1	53.4	54.2	61.0	63.6	64.2	64.8	64.1	65.3	60.2
Greece	51.4	53.1	57.9	56.6	55.3	59.8	63.6	59.8	54.9	52.7	51.6	51.4
Ireland	59.4	58.2	54.5	50.6	55.1	57.7	59.6	54.7	59.5	60.9	59.9	54.2
Latvia	53.7	57.0	59.1	61.6	60.5	63.7	63.5	65.1	66.8	66.0	63.9	62.7
Netherlands	59.9	61.8	66.3	66.3	69.4	65.0	64.7	66.3	67.9	65.3	64.9	64.3
Poland	49.4	51.9	51.2	53.5	53.2	52.5	51.9	53.7	56.3	52.7	52.0	55.7
Portugal	61.4	61.0	60.5	59.9	62.5	59.1	64.9	68.3	68.4	62.4	66.1	66.7
Slovakia	60.6	66.4	59.6	66.9	66.6	64.1	69.9	71.6	75.7	76.1	77.2	72.7
Spain	66.5	69.4	60.9	63.2	62.7	66.9	64.5	65.7	62.8	60.7	67.7	64.7
UK	59.2	58.3	51.7	50.7	54.2	61.0	61.3	60.2	60.2	58.9	60.6	55.2

Table 10: Level of EEI per country per year from 2003-2014 on the basis of PCA

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cyprus	68.9	70.6	71.3	72.3	73.3	73.2	78.2	74.7	79.3	73.0	81.1	71.9
Denmark	33.2	34.9	35.8	38.6	35.9	35.9	41.2	40.0	40.7	39.9	40.8	35.5
Estonia	52.3	55.1	57.9	58.7	61.7	59.2	61.4	59.2	59.5	60.2	59.5	56.4
France	63.1	62.8	62.4	60.7	62.4	64.6	67.7	69.2	69.3	68.1	70.2	65.7
Greece	62.9	65.7	70.0	68.8	67.8	69.9	74.2	70.1	63.8	58.8	60.4	58.9
Ireland	60.2	58.0	54.7	50.9	54.1	56.9	58.9	58.0	58.7	59.9	59.5	53.6
Latvia	52.6	55.3	56.1	58.8	58.3	61.4	59.8	61.4	65.2	64.3	64.6	62.1
Netherlands	64.2	65.2	68.2	67.1	70.3	64.4	63.9	64.7	64.5	61.3	63.3	62.5
Poland	52.8	51.8	52.5	55.5	54.0	53.1	55.1	57.5	59.1	54.6	55.6	53.9
Portugal	69.8	70.0	66.2	66.0	66.2	63.3	68.6	73.3	71.9	65.8	70.1	71.1
Slovakia	56.6	61.7	56.6	61.8	62.3	61.6	64.2	66.7	68.8	68.8	70.1	65.5
Spain	75.9	78.4	72.3	73.9	73.1	74.6	71.8	72.4	69.0	68.6	76.9	72.1
UK	63.1	62.9	56.8	57.6	61.9	66.5	68.2	67.3	67.1	64.3	65.8	59.2

Table 11: Level of EEI per country per year from 2003-2014 on the basis of equal weights

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cyprus	63.3	66.0	66.2	66.0	68.1	70.6	78.5	75.9	79.4	71.7	76.7	68.5
Denmark	47.1	48.0	46.9	49.7	43.0	47.3	56.7	54.4	55.2	55.8	56.6	50.5
Estonia	48.6	54.7	56.5	58.0	59.1	63.3	64.0	63.3	63.0	64.3	63.5	55.5
France	61.9	65.6	60.8	56.7	58.2	65.8	71.9	73.0	73.5	72.5	74.6	66.6
Greece	55.5	58.3	65.2	63.5	62.3	68.7	75.1	68.7	58.4	52.2	55.7	57.5
Ireland	60.9	62.0	57.0	51.0	54.4	58.3	65.1	59.9	64.1	67.0	67.3	59.4
Latvia	54.5	58.2	59.9	62.9	60.6	66.8	67.2	68.6	71.3	69.4	67.8	65.3
Netherlands	62.0	65.9	69.8	70.5	73.3	66.4	68.4	68.9	69.5	65.2	64.3	65.6
Poland	55.6	57.1	54.9	59.6	58.7	55.9	58.0	60.9	63.7	59.0	59.0	63.5
Portugal	64.0	65.4	63.8	63.0	66.5	60.3	70.4	75.3	72.7	65.5	71.1	72.1
Slovakia	59.4	67.1	57.1	66.7	66.4	62.6	71.8	73.1	76.0	75.9	77.8	71.3
Spain	73.6	77.6	67.6	69.0	67.0	72.7	73.0	73.7	70.1	67.9	78.5	73.4
UK	67.0	65.6	55.5	55.5	60.6	69.5	71.4	70.4	70.3	68.7	72.1	64.5

Table 12: Level of EEI per country per year from 2003-2014 on the basis of tailored weights

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cyprus	61.6	66.5	64.0	61.7	66.1	69.7	77.5	78.5	75.8	67.1	60.0	61.3
Denmark	46.6	47.3	42.8	44.3	34.0	45.0	53.7	51.3	50.7	53.7	53.2	49.5
Estonia	45.9	60.1	57.4	60.5	59.1	72.7	73.4	74.7	75.3	74.4	78.9	59.1
France	55.7	65.1	54.8	51.3	52.4	63.4	70.2	68.8	69.1	68.8	69.1	57.3
Greece	49.9	51.1	58.5	53.0	53.3	65.4	73.6	63.4	51.0	45.9	50.4	49.0
Ireland	46.7	53.3	46.6	41.8	44.1	51.7	62.2	64.3	62.6	62.8	61.9	53.2
Latvia	47.5	51.3	53.1	57.1	54.1	64.1	68.0	67.1	67.2	65.8	62.5	58.0
Netherlands	50.2	59.6	62.3	67.6	67.7	63.1	67.9	67.8	68.9	66.0	59.4	63.5
Poland	44.7	50.9	47.3	52.6	53.1	47.9	49.7	51.0	54.1	47.3	45.2	60.5
Portugal	56.8	60.8	59.0	59.9	66.5	58.5	72.0	72.8	68.3	59.7	63.1	65.5
Slovakia	55.1	63.4	51.7	66.6	65.2	60.6	77.3	76.3	80.0	79.7	81.2	73.1
Spain	71.7	74.6	62.0	67.5	63.2	71.5	75.3	76.9	74.4	70.6	74.3	74.6
UK	64.2	60.3	47.7	49.2	53.8	67.3	70.1	64.1	64.5	64.1	66.6	60.0

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