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Economic Effects of the EU External Aviation Policy

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Economic Effects of the EU External Aviation Policy

Abstract
This report investigates the economic effects of EU's external aviation policy with third countries. In particular, focusing on 27 countries with which the EU has an Air Services Agreement (ASA) of varying degree of liberalization, we assessed changes in fare, flight frequency and capacity utilization. We find that the implementation of the EU external aviation policy results in lower fare levels and higher load factors (capacity utilization). The effect of the policy on frequency, however, is not statistically significant. Our findings suggest that further liberalization can lead to more benefits to consumers.

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Executive summary

This report investigates the economic effects of EU's external aviation policy with third countries. In particular, focusing on 27 countries with which the EU has an Air Services Agreement (ASA) of varying degree of liberalization, we assessed changes in fare, flight frequency and capacity utilization. We find that the implementation of the EU external aviation policy results in lower fare levels and higher load factors (capacity utilization). The effect of the policy on frequency, however, is not statistically significant. Our findings suggest that further liberalization can lead to more benefits to consumers.

Policy context

In the last few decades, the European Union (EU) has been at the forefront of market liberalization in international air transport. After successfully deregulating its domestic market in the 1990s it started exporting its open market policies in 2005 to its neighbours and key strategic partners through comprehensive liberalization packages. Following the decision of the European Court of Justice in 2002 which overruled its member countries' Bilateral Air Services Agreements (BASAs), the EU has been negotiating Air Services Agreements (ASAs) as a block with third countries and regional blocks within the framework of its external aviation policy (European Commission 2005; European Commission 2016).

Three levels of agreements between the EU and external partners exist:

- Horizontal Agreements (HA), which replace the pre-existing BASAs of third countries with all EU Member States
- European Common Aviation Area (ECAA) agreements, where external partners adopt the EU legislation on aviation rules
- Key Strategic Partner (KSP) agreements, which have wider liberalization focus and establish processes for the liberalization of airline ownership, as well as regulatory convergence in matters of safety and security, competition, environment and passengers' rights

Key conclusions

The overall evidence is strong enough to suggest that the liberalization of the external EU aviation markets had a clearly beneficial impact on consumer welfare in the form of lower fares. The results also suggest that, as a second order effect, lower fares tend to lead to a growth in air travel demand. It is safe to conclude from the analysis that further liberalization can bring additional gains to both the aviation industry and the economy as a whole.

Main findings

Air passenger traffic is up to 27 % higher in countries where an External Agreement (EA) is in effect, compared to those which maintain traditional BASAs with the EU. Looking at the effect of the three types of EU's EAs independently, meanwhile, gives different results. While signing an HA leads to a higher level of passenger traffic, the other two agreement types, ECAA and KSP, appear to have unexpected (negative) signs. These effects, however, are not statistically significant at conventional levels.

Higher levels of per capita GDP and population lead to higher demand. The effect of distance, however, is non-linear. Demand appears to increase as the distance between countries increases, which implies that air travel is the most preferred mode for longer journeys. After a certain point, distance becomes an impedance to air travel because social and economic interactions between countries tend to decline the farther countries lie apart from each other. Similarly, air transport flows between contiguous partner countries is found to be lower probably due to the availability of other modes. Interestingly, demand is higher for landlocked partners and those which share a common official language and colonial past, as expected.

There is no statistically significant increase in the growth rate of demand prior to signing an EA. In fact, an EA starts to affect demand growth only after three years of its signing, which is reasonable given that time is needed for airlines to adjust to a new regulatory regime. Interestingly, the effect of an EA progressively increases with time, reaching as high as 45 % after 7 years.

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Quick guide

Section 1 of this report summarizes the research background and Section 2 provides the policy context for this study. Section 3 presents the empirical framework followed by description of the data in Section 4. Section 5 and 6 present the results and conclusions of the study, respectively.

1 Introduction

In the last few decades, the European Union (EU) has been at the forefront of market liberalization in international air transport. After successfully deregulating its domestic market in the 1990s it started exporting its open market policies in 2005 to its neighbours and key strategic partners through comprehensive liberalization packages. Following the decision of the European Court of Justice in 2002 which overruled its member countries' Bilateral Air Services Agreements (BASAs), the EU has been negotiating Air Services Agreements (ASAs) as a block with third countries and regional blocks within the framework of its external aviation policy (European Commission 2005; European Commission 2016). This approach was pioneering in the sense that individual countries handed over the economic regulation of their international air market to a regional body. The EU example also beckoned the era of a potential multilateral approach for achieving global air transport market liberalization.

Over the last 10 years the EU has concluded or negotiated external agreements (i.e. ASAs with non EU countries) with 54 countries, including the Open skies policy between the EU and the US in 2008. While an extensive body of work that looks the effects of regulatory reform on the intra-European aviation market is available in the literature, surprisingly we know little about the economic effects of EU's external aviation policy. The time for evaluation of this policy is ripe as enough time has elapsed since the road map for the policy was set in 2005.

This paper explores whether routes governed by EU's external aviation policy have lower fares and higher service quality compared to those governed by the traditional BASAs as would be expected in a liberalized air transport market. We argue that the external policy plays an important role in bringing the benefits of competitive market forces to travellers. By analysing traffic flows between EU 28 countries and 27 external partners in 4 continents with which the EU has a varying degree of liberalization, we find that the external policy has led to up to a 20 % reduction in fares. These changes in fares spurred a 27 % increase in demand. Although it has no statistically significant effect on flight frequencies, we find that carriers that operate in routes governed by the policy have higher capacity utilization.

Studying EU's international aviation markets is interesting for two main reasons. First, although the EU has always been considered as the "vanguard" of the movement for liberalized international air transport markets (Borenstein and Rose, 2007), the progress in terms of agreements actually signed is still slow. The progress in negotiations with each of the EU´s external partners depends on several economic, geographic, market or political aspects (to name just a few) that often raise concerns as regards the impact that opening up of the market would have on the aviation market of the EU or its partner. While the overall policy strategy of the EU is building open aviation partnerships in many parts of the world, its recent emphasis on issues like "fair competition" and "level playing field" has been interpreted by some as a protectionist move (see Tretheway and Andriulaitis 2015; de Wit 2014). Furthermore, the lack of solid empirical analysis/evidence which shows the economic effects of EU's external aviation policy has limited its faster implementation. By thoroughly evaluating the developments in market demand, fares, frequency and capacity utilization in the past 14 years this paper contributes to this timely and critical topic.

The second reason for studying EU's international aviation market is that the EU is the largest regional group which negotiates comprehensive ASAs on behalf of its members. Evaluating this policy with regard to its economic outcomes and implications is crucial to distil transferable insights for other aspiring regions which aim to follow EU's example of plurilateral negotiation of ASAs. The study also brings empirical evidence from one of the most important aviation markets of the world to the table.

This paper builds on the significant body of literature on liberalization of aviation markets. As pointed out by Borenstein and Rose (2007), the airline industry has been a prime example on how unrestricted markets achieve efficient production and allocation of outputs, and on the role of government intervention in improving efficiency. Ever since the US deregulated its domestic air transport market in 1978, several studies have shown that deregulation/liberalization leads to traffic growth by removing constraints on pricing, market entry, flight frequency and network formation (see Fu et al 2010 and Borenstein and Rose 2007 for a comprehensive review). The liberalization of air transport has also been instrumental in lowering costs for freight transport by facilitating global supply chains as evidenced by the rise of air cargo’s modal share, especially for transporting high value goods (Hummels and Schaur 2013; Micco and Serbrisky 2006). It has also been shown that competitive air transport markets result in efficiency gains for airlines (Fethi et al 2010; Oum et al 2005), and increased employment both in the aviation sector and other travel dependent sectors such as the high-tech industry and tourism (Button and Taylor 2000).

The last few years saw a renewed interest in the issue of air transport liberalization from two different perspectives. On one hand, a number of recent studies provided new evaluations of the major liberalization initiatives in the US (Winston and Jan 2014; Cristea et al 2014), EU (Burghouwt and de Wit 2015), Africa (Abate 2016), Northeast Asian (Adler et al 2014), and the Middle East (Cristea 2015). At a more global level, using a sample of 184 countries Piermartini and Rosova (2013) find that liberalization has brought up to 10 % increase in air passenger flows. The interest in liberalization also comes from studies aimed at analysing future market developments. A long term forecast of the global air transport demand made by the OECD crucially depends on the extent to which the world progresses in terms of liberalization (Benezech et al. 2016). These studies not only confirm the beneficial effects of liberalization but also quantify the welfare effects of what could be achieved by pursuing a more liberal policy in the future. On the other hand, the renewed interest on liberalization comes from the fear of “destructive competition” (Borenstein and Rose 2007) or “heightened competition” (ICAO 2013). This fear is fuelled by the continuous expansion of Gulf airlines (Dresner et al 2015), the emergence of long-haul inter-continental flights by LCCs (De Poret 2015) and the dominance of global airline alliances (OECD 2014). These developments have resulted in a policy uncertainty in major aviation markets such as the EU and US to the extent of endangering liberalization efforts.

Despite the above concerns the literature consistently shows that the fortunes of the air transport industry is largely determined by its cost structure, demand and fuel price fluctuations, and infrastructure bottlenecks rather than “destructive competition” arguments (Borenstien and Rose 2007). European major carriers are usually shown to have a higher cost base (especially labour) compared to their rivals. Some argue that this high cost base, not liberalization, is making Europe lag other regions in terms of connectivity and airline profitability to the extent of being by passed as a global-hub (CAPA 2016; CAPA 2014). Thanks to deregulation, the expansion of LCCs has stimulated cost cuts throughout the whole aviation industry. The benefits of market forces in the confines of the EU are well documented (Burghouwt and de Wit 2015). What remains to be seen is whether the EU and its partners could benefit from a more liberal aviation policy, which is the subject of this paper.

2 Policy context

The EU's external aviation policy aims to open up international aviation markets on legal and economic grounds. Following the 2002 European Court of Justice Decision which annulled the BASAs, the EU started to renegotiate ASAs with external partners with the objective of removing discrimination against "community" carriers (i.e. carriers based anywhere in the EU). The partners signing the new ASAs effectivity opened up their aviation market to all European airlines. As for the economic reasons, the external policy aims at promoting commerce and mobility. It is also seen as a strategic initiative which would improve the position of European airlines. This is especially true for European full service (legacy) airlines whose fortunes are substantially dependent upon long-haul international (non-EU) routes. Europe's Big 3 (Lufthansa, British Airways/Iberia, Air France-KLM) have 80% of their capacity in international markets, where competition is intense and new entry is commonplace (CAPA 2016). As noted by Burghouwt and de Wit (2015) the external policy did also facilitate the emergence of international LCCs.

Increasing the number of international aviation agreements has long been a policy priority for the EU (European Commission, 2012). Agreements with strategic external partners were not to be limited to simply opening up markets, but sought a wider liberalization focus which included the liberalization of airline ownership and regulatory convergence in matters of safety and security, competition, environment and passengers´ rights. The EU external aviation strategy was updated in the recent Aviation Strategy for the EU (European Commission, 2015) which highlights three policy goals:

- Stimulate growth in EU external aviation markets, through improving services, market access and investment opportunities with third countries, while guaranteeing a level playing field;
- Overcome limits to growth, by reducing capacity constraints and improving efficiency and connectivity;
- Ensure high safety and security standards, by introducing a risk and performance based mind-set;

Three levels of agreements between the EU and external partners exist (European Commission 2005):

- Horizontal Agreements (HA), which replace the pre-existing BASAs of third countries with all EU Member States
- European Common Aviation Area (ECAA) agreements, where external partners adopt the EU legislation on aviation rules
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From the European perspective, the rapidly evolving global market creates competitive challenges, in particular as a result of a shift of economic growth to the East. New competitors are benefitting from the rapid economic growth of the entire region, notably Asia, and from aviation becoming a strategic element in their home-country's economic development policies. Geography certainly plays a role for aviation markets, but several other factors can improve or distort competition. The availability of suitable infrastructure, the nature of economic, fiscal and regulatory regimes, and historic, cultural and trading links all play a part. This study shades light on some of the economic issues using the following empirical model. Christidis (2015) analyses how EU's external policy has shaped air transport networks and the degree of concentration in Morocco, USA, Russia and Turkey. While he finds improved air services and enhanced spatial distribution of airport connections in the EU-Morocco market, in the other three markets liberalization appears not have a significant effect well and above the existing market trend. Christidis notes that the air transport market is sensitive to the general economic and political factors the EU has with the three countries.

3 Empirical framework

The empirical model in this paper is based on the proposition that the liberalization of international air transport market mainly affects supply side variables such as fare, frequency and capacity utilization. The type of data we have forced us to undertake two separate but related empirical analyses. The two main data sources for this study are the EUROSTAT online database which is publicly available and a proprietary dataset from Sabre® (see Section 4 for details). The former, which is an aggregate annual level data, is used to analyse passenger flows in the country pairs in our sample. The Sabre dataset includes detailed activity and price information during the months of March (off-peak season) and August (peak season) for the years 2002 to 2015. Although this data is only for two months for each year, it has richer set of variables. Most importantly, it includes average base fare data charged by airlines operating in the country pair markets. Furthermore, the data from 2010 to 2015 includes departure frequency information which allows us to analyse the effect of EU's external policy on service quality.

3.1 Air transport demand

We begin our empirical analysis by specifying a model of annual passenger flows. To estimate the impact of liberalization on air passenger flows, we rely on the time series dimension of the EUROSTAT data. Akin to the "difference-in-differences" estimation method, our identification strategy compares the change in passenger flows within a country pair before and after the introduction of EU's external policy (treatment group), with the corresponding flows calculated for countries that maintain traditional BASA with the EU (control group). Following the literature, we employ the following gravity-type model for examining air transport flows (demand) between countries.

$$(1) \qquad LogPAX_{ijt} = \delta_i + \phi_j + \gamma_t + \beta_1(EA_{jt}) + X\beta_2 + u_{ijt}$$

Where, the dependent variable $LogPAX_{ijt}$ is the total (non-directional) number of air passenger travellers between an EU country i and an external partner j in year t; δ_i, ϕ_j and γ_t are EU country, partner country and time fixed effects, respectively; stands for an idiosyncratic error term. The use of aggregate country-level flow rather than route-level or route-and-carrier-specific data is due to lack of data. The EUROSTAT website provides airport-level flows for some of the countries in our sample but not in a consistent manner spanning the study period. Using such an aggregated flow forces us to make a strong symmetry assumption with respect to airline behaviour. While such an approach doesn't allow us to control for the effect of firm/route heterogeneity, it allows analysing aggregate or average market behaviour as suggested by Schipper et al (2002) and Dresner and Tretheway (1992). Country pair level analysis can also be more informative because ASAs are negotiated at the country-pair and not at the route/carrier level.

The main explanatory variable of interest in Equation 1 is, EA_{jt}, which is a dummy variable that equals 1 for periods when an External Agreement (EA) is in effect between the EU and partner country j. The EU's external aviation policy is aimed at fostering a competitive aviation market by improving market access for airlines. To the extent that the pursuant competition from opening up of aviation markets leads to lower fares and/or higher service quality, travellers can be expected to fly more. We, therefore, expect EA to have a positive effect on the annual number of air passengers.
Equation 1 includes standard control variables in vector *X* such as: distance, the distance in kilometres between the most populated cities in countries i and j; contiguity, whether countries share a common boarder; colony, whether countries share colonial history; and

language, whether countries have similar official language. As noted by Piermartini and Rosova 2013 the effect of distance on passenger flow is likely to be non-linear. As the distance between two countries increases passengers give more preference to air transport over other modes of transportation. For countries which are far away from each other, however, distance becomes an 'impedance' variable for air passenger flow because social and economic interactions between countries tend to decline with it. Furthermore, air fare becomes prohibitively high beyond certain distance which reduces the flow of passengers. To account for both opposing effects of distance on passenger flow, we include two variables: distance and the square of distance.

Similarly, we expect a negative effect of having a common border on the volume of passenger flows. This is due to the likely presence of alternative modes of transport. On the other hand, we expect a higher flow of passengers if a partner country is landlocked and shares a common colonial history and language with an EU country. Finally, Equation 1 controls for additional variables commonly referred to as 'generative' variables because they reflect the catchment area for potential travellers. These are the population and GDP of route end countries, which are expected to generate higher level of passenger flows as both increase.

There are two econometric challenges associated with estimating Equation 1. First, it is possible that the EU might have more incentive to get into an external agreement with countries with which it stands to get the most. This puts an upward bias in our estimate of the effect of the external policy because some omitted variables affect the likelihood of signing EU’s external agreement. This problem is particularly acute for partner countries which signed the Key Strategic Partners (KSP) agreement, and to some extent those which singed the European Common Aviation Area (ECAA) agreement, because it is likely that the EU anticipated a future growth of air transport to these partners. It is, however, less relevant for Horizontal Agreement (HA) partner countries because as of 2002 all of EU member states BASAs were replaced by an external agreement following the ruling by the European Court of Justice. We can, therefore, safely assume that signing the HA is a decision imposed exogenously by the Court and not a decision taken based on the underlying or anticipated traffic growth. To account for the possibility that some omitted variables affect the likelihood of signing an external agreement, we evaluate the effect of each of the three external polices, that are HA, ECAA and KSP, in separate regressions. We also look at the effect of signing any of these agreements.

The second econometric challenge is that there are changes in the growth rates of air transport demand that happen to coincide with the signing EU’s external policy. To investigate this possibility, we follow the lead of Cristea et al. (2014) and estimate the following growth equation:

$$(2) \qquad gPAX_{ijt} = \delta_i + \phi_j + \gamma_t + \lambda_1 (EA_{jt} * t) + gX\lambda + \varepsilon_{ijt}$$

Where $gPAX_{ijt}$ is the growth rate of passenger flow; the external agreement dummy (EA) interacts with a vector of time dummies corresponding to one lead and seven lags of the signing of the external aviation agreement. The leads and lags dummies enable us to see whether passenger traffic was already growing prior to signing of the external agreement, or whether changes in growth rates correspond to the year the agreements were signed. Equation 2 also includes the growth rates of the population and GDP variables and other control variables explained under Equation 1 above in vector *gX*.

3.2 The effect of liberalization on fare, departure frequency and capacity utilization

The Sabre data allow us to specify detailed demand, fare and departure frequency models. Because fare and other supply side variables are not included in the demand model in Equation 1, the EA dummy might pick up the effect of supply variables. While the EU's external air transport policy, as in any other liberalization initiative, can potentially increase demand, we maintain the assumption that its effect on demand is indirect. Put differently, air transport demand increases as a result of lower fare and/or higher service quality, variables which are more likely to be directly affected by changes in regulatory policy. We start by specifying the following demand equation:

$$(3) \qquad Logpax_{ijm} = \delta_i + \phi_j + \gamma_m + \pi_1(Logfare_{ijm}) + X\pi \ + \xi_{ijm}$$

where subscript m denotes months March and August; $Logpax_{ijm}$ denotes the total (non-directional) number of travellers; $Logfare_{ijm}$ is the base round trip fare; X is a vector which contains the control variables defined under Equation 1 above. All continuous variables are in logarithm which allows us to interpret coefficient estimates as elasticity. The effect of fare is expected to be negative and captures the slope of the demand curve. We treat the fare variable as endogenous due to the simultaneous determination of supply and demand. Section 3.3 explains how we handle the endogeneity problem.

An important effect of liberalization of international air transport is its effect on fare. Restrictive regulatory environment incentives airlines to engage in collusive practices which lead to higher fares (Dresenr and Tretheway 1992). The relaxation of the regulatory environment, on the other hand, brings competition which in turn leads to a decline in fare. The fare model is specified as:

$$(4) \qquad Logfare_{ijm} = \delta_i + \phi_j + \gamma_m + \theta_1(EA_{jt}) + \theta_2(Logpax_{ijm}) + Z\theta \ + \nu_{ijm}$$

The main variable of interest, that is EA_{jt}, is expected to have a negative effect. The effect of $Logpax_{ijm}$ on fare is of empirical matter. Higher demand could lead to higher fare if there is capacity constraint (e.g. scarce slot at airports, which is a common problem at many European hubs) or it could lead to lower fares if carriers realize economies of density. Z contains vector of control variables such as fuel price, distance and per capital GDP. The country and year fixed effects capture unobserved heterogeneity in the cost of operating planes across routes and time. The $Logpax_{ijm}$ variable is treated as endogenous in Equation 4 to avoid the simultaneity bias.

As noted in Footnote 4, it might not be informative to estimate a frequency model for our sample due to data unavailability. Carriers may respond to an increase in demand or a change in regulatory environment by increasing aircraft capacity or by increasing flight frequency. Judging by the trend of aircraft size in our sample (Figure 5), compared to 2002 level, seats per flight are higher by 30 % in 2015 for external policy partner countries which implies that it might be difficult estimate a frequency model. This is further compounded by the lack of market structure information for our sample such as the number of carriers in a market. Alternatively, as suggested by Winston and Jan (2015), we estimate the effect of liberalization on capacity utilization, measured by the level of the load factor (LF). It is more likely that route rationalization in the wake the external agreement, allows carriers to improve the load factor. Accordingly we consider the following model of capacity utilization:

$$(5) \qquad LogLF_{ijm} = \delta_i + \phi_j + \gamma_m + \psi_1(EA_{jt}) + Y\psi_2 + \omega_{ijm}$$

3.3 Estimation and model identification

The estimation of the demand and fare equations poses two main econometric challenges. The first one is simultaneity bias because demand and supply (fare) are determined simultaneously at equilibrium. Secondly, the panel nature of our dataset raises potential concerns of serial correlation and heteroskedasticity. To account for these challenges, we estimate Equations 3 and 4 using both two-stage-least-squares (2SLS) and three-stage-least-squares (3SLS) procedures. These methods require the use of specific instruments for endogenous variables. The selection of instruments is based on the literature and data availability.

In the 2SLS procedure, we use fuel price interacting with the distance and the liberalization indicators as instruments for fare in the demand model, i.e. Equation 3. Fuel costs are one of the major components of carriers operating costs, especially during our sample period which saw the doubling of jet fuel prices from their 2002 level. Interacting fuel price with distance captures the possibility that fuel costs are more important for shorter flights. This is because most of an aircraft's fuel burn occurs during take-offs and landings, which makes fuel costs relatively higher for shorter trips compared to longer trips. In the fare regression, i.e. Equation 4, we instrument for demand through the following variables: a dummy variable which indicates whether countries have colonial relationship/common language, population of endpoint countries and bilateral trade between them.

Both the 2SLS and 3SLS procedures address endogeneity concerns. Their implementation procedure, however, has advantages and disadvantages. The sequential nature of the 2SLS procedure, while allowing each equation to be interpreted separately, does not fully capture the simultaneity between fare and demand. The 3SLS procedure effectively solves the endogeneity problem because it estimates all equations simultaneously akin to the seemingly unrelated regressions procedure (Zellner and Theil, 1962). It is, however, more sensitive to model misspecification compared to 2SLS (Kennedy, 2003). We apply both models for comparisons purposes.

4 Data

The empirical analysis in this paper is based on data from two main sources. We gathered annual passenger volume and flight frequencies at country-pair level between EU 28 and 27 external (non-EU) countries from the EUROSTAT online database for the period 2002-2014 (EUROSTAT- table avia_pae, 2014).While the EUROSTAT database is one of the very few publicly available sources of information to analyse traffic developments in Europe, it has two main limitations. First, it does not report fare and other supply characteristics which are important for our analysis. Second, it does not report "true" origin-destination (OD) pair flows of passengers and flight. The EUROSTAT data include passenger flows between country-pairs that have origins and/or destinations beyond the international segment country-pairs.

Data from Sabre was used in order to complement the analysis by filtering "true" country pair OD passenger flows (Sabre 2016). Most importantly, the Sabre data provide us with information on fare, load factor and departure frequency, variables which are crucial for studying the impact of air transport market liberalization. Unfortunately, we could only gather data for two months per year, March, for an off-peak season, and August, for a peak-season. While the Sabre data limits our ability to analyse annual changes in traffic activity, it allows us to capture seasonality.

The World Bank's World Development Indicators online database is the source of country GDP and population variables (WDI 2016). Gravity variables (official language, colonial relationship, landlocked, contiguity and distance) are from Bacchetta et al. (2012). The trade data that is total value of exports and imports between OD pairs, come from United Nations' Commodity Trade Statistics Database (http://comtrade.un.org/db/) Jet fuel prices were gathered from US Energy Information Administration website (https://www.eia.gov/).

The status of air services regulation between the EU and our sample of partner countries is given on Table 1. The list of countries represents a wide range of geographic coverage, market size (traffic densities) and stage lengths (flight distances). Most importantly, the sample is composed of partner countries with a varying degree of regulatory status with the EU. In addition to external policy partner countries, Table 1 lists EU's partners with which air transport service is based on traditional BASAs. We include BASA partner countries in our sample for econometric reasons. We use the so called difference-in-differences (DID) methodology to identify the effects of EU's external aviation policy agreements on fare, load factor and frequency using BASA partner countries as a control group assuming that their regulatory status was unchanged. Doing so helps us overcome the lack of counterfactuals which beset earlier evaluations of air transport policies (Pitfield, 2009).

Table 1. List of Partners and Status of EU's External Aviation Policy

External Partner	Year-Most Current Agreement	Year- Horizontal Agreement	Type of Agreement
Albania	2006	2006	HA
Algeria			BASA
Argentina			BASA
Armenia	2008	2008	HA
Azerbaijan	2009	2009	HA
Brazil	2011	2011	KSP

External Partner	Year-Most Current Agreement	Year- Horizontal Agreement	Type of Agreement
Canada	2009		KSP
Chile	2005	2005	HA
China			BASA
Egypt, Arab Rep.			BASA
Georgia	2010	2008	ECAA/HA
Israel	2013	2008	ECAA/EUMED
Japan	2009	2009	HA
Jordan	2010	2008	HA
Lebanon	2006	2006	HA
Libya			BASA
Macedonia, FYR	2008	2008	ECAA/HA
Moldova	2012	2008	ECAA/HA
Morocco	2006	2006	ECAA/EUMED
Oman			BASA
Qatar			BASA
Russian Federation			BASA
Saudi Arabia			BASA
Tunisia			BASA
Turkey	2010	2010	HA
Ukraine	2006	2005	HA
United Arab Emirates	2007	2007	HA
United States	2007		KSP

Note: Table lists Partner countries analysed in this study with which the EU has the three types of external aviation agreements: Horizontal Agreement (HA), European Common Aviation Area Agreement (ECAA) or the Key Strategic Partners (KSP) Agreement. For a complete list of countries with which the EU has an agreement related to air transport or with which such an agreement is currently under negotiation see http://ec.europa.eu/transport/modes/air/international_aviation/country_index/index_en.htm

Figures 1A and 1B display trends in passenger traffic and flights observed in the EUROSTAT data. During the sample period we see a tripling of extra EU passenger traffic flow and quadrupling of flight frequencies for partner countries with an external agreement with the EU. The same increasing trend, albeit at a lower rate, is shown for partner countries with traditional BASA arrangements. Figure 2 shows that average base fare (nominal) for external agreement partner countries has remained relatively flat, and in fact declined by 25 % by the end of the sample period. Although these comparisons do not hold any other influences on fares constant, they reveal that fare levels have been relativity lower for routes operated under external agreement. Evidently, August fares are higher compared to their March levels confirming the peak season yield management practice of airlines.

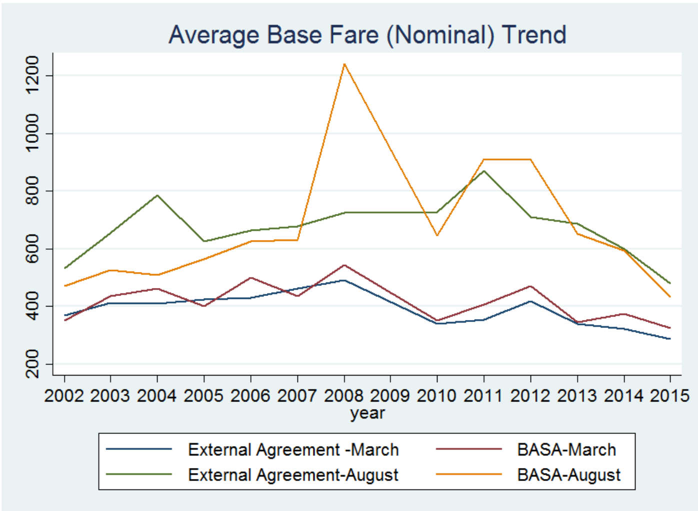
Figure 1. Annual Passenger Flow and Flight Frequency Index Using Eurostat Data

1A : Total Passenger Flow

1B : Total Annual Flight Frequency

Source: EUROSTAT

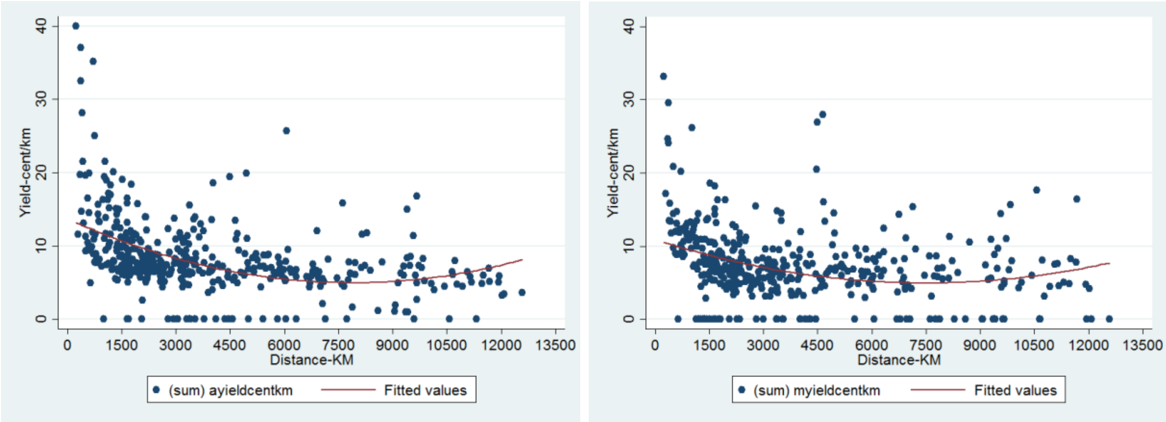
Figure 2. Average Base Fare (Nominal) Trend



Source: Sabre

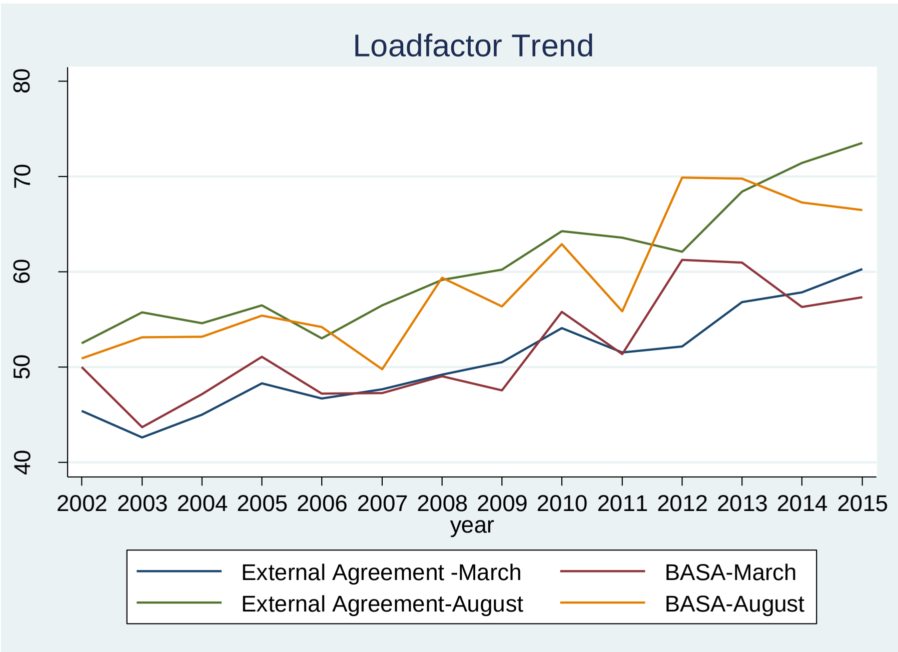
The relationship between yields (average fare per kilometre) and distance are consistent with findings in the literature for deregulated markets (Morrison and Winston) and recent findings for open skies routes in the US (Winston and Jan, 2014). As seen in Figure 3, yield declines with route distance because the fixed costs of take-off and landing are distributed over longer distances (economies of distance). Figure 4 shows that capacity utilization, measured by the load factor, has also been increasing. In general, capacity utilization for external partner country routes is relatively smoother for both March and August months, and it is higher for external policy partners for all but three years for August. Interestingly, as shown in Figure 5, aircraft size, measured as seat per departure suggests that carriers operating in routes under EU external aviation agreement saw a much higher rate of introduction of larger aircrafts. This is reasonable as our sample period saw the introduction of bigger aircrafts such as the Airbus 380 and Boeing 787, which appear to be used more frequently in routes involving external agreement signatory countries.

Figure 3. Yields over Distance, year 2014



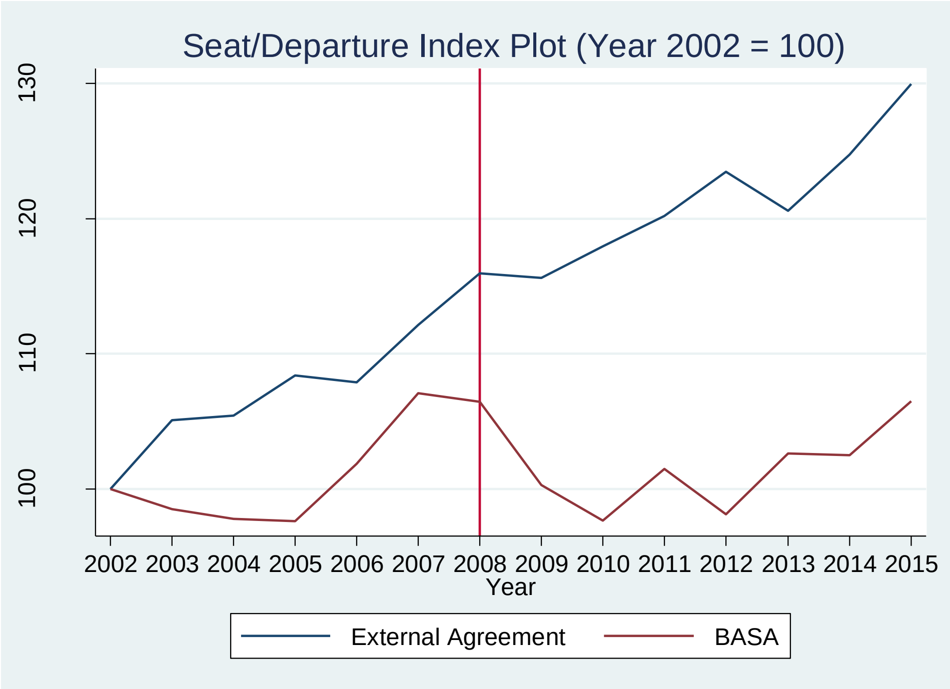
Source: Own calculation based on Sabre data.

Figure 4. Capacity Utilization Trend



Source: Own calculation based on Sabre data

Figure 5. Aircraft Size Growth Index



Source: Own calculation from Sabre schedule data

5 Results

Table 2 presents estimation results from the demand model specified in Equation 1. The results are, in general, consistent with conventional wisdom and expectation. Air passenger traffic is up to 27 % higher in countries where an EA is in effect compared to those which maintain traditional BASAs with the EU. Looking at the effect of the three types of EU's EAs independently, meanwhile, gives different results. While signing an HA leads to a higher level of passenger traffic, the other two agreement types, ECAA and KSP, appear to have unexpected (negative) signs. These effects, however, are not statistically significant at conventional levels.

The remaining explanatory variables have plausible signs and are mostly significant at least at the 10 % level. As expected, higher levels of per capita GDP and population lead to higher demand. The effect of distance is non-linear. Demand appears to increase as the distance between countries increases, which implies that air travel is the most preferred mode for longer journeys. After a certain point, however, distance becomes an impedance to air travel because social and economic interactions between countries tend to decline the farther countries lie apart from each other. Similarly, air transport flows between contiguous partner countries is found to be lower probably due to the availability of other modes. Interestingly, demand is higher for landlocked partners and those which share a common official language and colonial past, as expected.

Table 3 presents results from Equation 2 which specifies covariates of the growth rate of air transport demand. The purpose of this estimation is to check whether the signing an EA coincides with underlying trend of air traffic to the signatory partners. As it turns out, there is no statistically significant increase in the growth rate of demand prior to signing an EA. In fact, an EA starts to affect demand growth only after three years of its signing, which is reasonable given that time is needed for airlines to adjust to a new regulatory regime. Interestingly, the effect of an EA progressively increases with time, reaching as high as 45 % after 7 years.

While the results in Table 2 are broadly consistent with expectations, the data we used for estimation are rather aggregate. Table 4 presents results from the demand model specified in Equation 3. The most important difference here is that in addition to the "gravity type variables", demand is now a function of fare. For both months, we find a price elastic demand. Passengers in the month of March show slightly higher price sensitivity, which is expected given that this an offseason period when airlines usually offer deals.

Tables 5A and 5B present the fare model specified in Equation 4 for the months of March and August, respectively. Looking at the main variables of interest, HA and ECAA type agreements have significant negative effects on fare levels for both months. While signing any of EU's external agreements affects fare negatively in August, it does not affect March fares. These results are expected because liberalization leads to price reduction as result of competition. What is unexpected is the positive effect of signing of KSP type agreements on fare for both months. This is partly due to the econometric challenges mentioned in Section 3 as it is difficult to control for unobserved effects that simultaneously affect the probability of signing the ECAA and KSP type agreements and the level of air traffic flow. These mixed results could also be due to not having a good comparator (counter-factual) country, especially for the three KSP signatory countries namely, USA, Canada and Brazil. Another interesting result is that the number of passengers has a negative and significant effect on fare. This result implies the presence of excess capacity and/or realization of economies of traffic density (Nero, 1998).

Table 2. Determinants of International Passenger Traffic

Dependent variable: *Log. PAX*	Any EA	HA	ECAA	KSP
Any EA	0.246**			
	-0.105			
HA		0.243**		
		-0.104		
ECAA			-0.0985	
			-0.129	
KSP				-0.0541
				-0.215
Log per capita GDP	0.146***	0.143***	0.146***	0.144***
	-0.0183	-0.0183	-0.0184	-0.0186
Log. population	0.135***	0.134***	0.133***	0.133***
	-0.0113	-0.0113	-0.0114	-0.0114
Log. distance	3.511***	3.504***	3.464***	3.479***
	-1.142	-1.142	-1.144	-1.144
Log. distance squared	- 0.428***	- 0.428***	- 0.425***	- 0.426***
	-0.0802	-0.0802	-0.0803	-0.0803
Colonial Relationship	0.280*	0.281*	0.276*	0.277*
	-0.155	-0.155	-0.155	-0.155
Contiguous partner	- 0.657***	- 0.658***	- 0.657***	- 0.657***
	-0.184	-0.185	-0.184	-0.184
Common official language	1.706***	1.707***	1.708***	1.707***
	-0.19	-0.191	-0.191	-0.191
Land locked partner	2.807***	2.790***	0.902***	2.762***
	-0.292	-0.291	-0.253	-0.292
Constant	- 39.10***	- 38.62***	- 38.29***	- 38.34***
	-5.471	-5.466	-5.475	-5.492
Observations	7,085	7,085	7,085	7,085
R-squared	0.611	0.611	0.611	0.611
Country Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Note: Any EA is a dummy variable which equals 1 if a partner country has signed any of the three External Agreements of the EU, namely: Horizontal Agreement (HA), European Common Aviation Area Agreement (ECAA) or the Key Strategic Partners Agreement (KSP).
Standard errors: *** p<0.01, ** p<0.05, * p<0.1

Table 3. Effect of EU's External Agreement (EA) on Passenger Growth

Dependent variable: g*Log. PAX*	Lags and Lead
Any EA	
Year Prior to EA	-0.0347
	-0.118
Year EA Signed	0.124
	-0.113
1 Year After EA	0.11
	-0.12
2 Year After EA	0.18
	-0.127
3 Year After EA	0.259*
	-0.134
4 Year After EA	0.299**
	-0.136
5 Year After EA	0.22
	-0.154
6 Year After EA	0.290*
	-0.175
7 Year After EA	0.447**
	-0.192
Constant	-15.04***
	-3.331
Observations	6,966
R-squared	0.104
Country Fixed Effects	Yes
Region Fixed Effects	Yes
Year Fixed Effects	Yes

Note: The regressions on Table 3 controls for other variables, namely growth rates of per capita GDP and population, distance, distance squared, language, contiguity, and colonial and landlocked dummies. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4. Two-stage Least Squares Demand Model

	(1)	(2)
Dependent variable: logpax	March	August
Log fare	-1.839***	-1.824***
	-0.504	-0.572
Log per capita GDP	0.0742***	0.0975***
	-0.0084	-0.0088
Log population	0.113***	0.0788***
	-0.0146	-0.0164
Log distance	9.194***	11.57***
	-1.169	-1.191
Log distance squared	-0.782***	-0.934***
	-0.0844	-0.0873
Colonial Relationship	0.504***	0.442***
	-0.155	-0.162
Contiguous partner	0.0248	-0.127
	-0.206	-0.232
Common official language	1.945***	1.857***
	-0.168	-0.171
Constant	-79.45***	-96.22***
	-7.133	-7.319
Observations	4,901	5,119
R-squared	0.602	0.585
Country Fixed Effect	Yes	Yes
Year Fixed Effects	Yes	Yes

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5A. Two-stage Least Squares Estimates of Fare model: March

Dependent variable: logfare	Any lib	H lib	NEB lib	Key lib
Any EA	0.0126			
	-0.0204			
HA		-0.0560***		
		-0.0205		
ECAA			-0.230***	
			-0.0278	
KSP				0.278***
				-0.0327
Log passengers no.	-0.0237***	-0.0242***	-0.0239***	-0.0224**
	-0.0092	-0.0092	-0.0091	-0.0091
Log per capita GDP	0.00409**	0.00404**	0.00404**	0.00522***
	-0.0017	-0.0017	-0.0017	-0.0017
Log distance	0.169***	0.168***	0.163***	0.161***
	-0.237	-0.237	-0.235	-0.236
Log fuel price	0.322***	0.319***	0.334***	0.333***
	-0.0509	-0.0508	-0.0506	-0.0506
Constant	4.612***	4.667***	4.624***	3.984***
	-1.488	-1.481	-1.471	-1.472
Observations	4,899	4,899	4,899	4,899
R-squared	0.698	0.699	0.703	0.702
Country Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Note: Standard errors: *** p<0.01, ** p<0.05, * p<0.1

Table 5B. Two-stage Least Squares Estimates of Fare model – August

Dependent variable: logfare	Any lib	H lib	NEB lib	Key lib
Any EA	-0.0612***			
	-0.0198			
HA		-0.110***		
		-0.0198		
ECAA			-0.197***	
			-0.0266	
KSP				0.207***
				-0.0317
Log passengers no.	-0.0216**	-0.0217**	-0.0212**	-0.0206**
	-0.0089	-0.0088	-0.0088	-0.0089
Log per capita GDP	0.00360**	0.00381**	0.00390**	0.00482***
	-0.0017	-0.0016	-0.0016	-0.0016
Log distance	0.215***	0.217***	0.220***	0.224***
	-0.027	-0.027	-0.0269	-0.027
Log fuel price	0.401***	0.402***	0.418***	0.421***
	-0.0498	-0.0496	-0.0495	-0.0496
Constant	2.359**	2.219**	2.059**	1.431
	-1.014	-1.005	-1.002	-1.008
Observations	5,118	5,118	5,118	5,118
R-squared	0.694	0.695	0.696	0.695
Country Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Note: Standard errors: *** p<0.01, ** p<0.05, * p<0.1

Table 6 presents results from models of capacity utilization specified in Equation 6. The signs of the explanatory variables are broadly plausible. The load factor is higher in routes with higher volumes of passengers. While it has the right positive sign, the EU's external policy is only significant for the off season month of March. This finding implies that, everything else being equal, planes are fuller during low seasons when an EP is place. Another interesting result is the quadratic effect of distance on capacity utilization. This non-linear effect reveals the trade-off airlines face in allocating their fleet to different flight segments. Normally, aircraft size increases with flight distance which in turn can lower load factor (as filling up a larger aircraft is harder). After a certain distance, however, load factor improve because of the prohibitive cost of operating a partially filled large aircraft over a long distance.

As noted in Section 3, estimating a frequency model for our sample could be problematic due to data unavailability. For the sake of completeness, however, we looked at determinants of flight frequency including EA dummies. The results from this model are presented on Table 6. It appears that signing an external agreement has a positive but statistically insignificant effect. Interestingly, the coefficient of passenger numbers suggests that an increase in the number of passengers results in a less-than-proportional increase in departure frequency. Schipper et al (2002) also found a similar result for intra-European air transport markets. Their explanation indicates that, at constant aircraft size, an increase in the number of passengers is accommodated partially by a frequency increase and partially by an increase in the load factor, as shown in our result above. Finally, both distance and aircraft size have the expected negative effect on frequency and are highly significant at the 1% level. Distance is a major 'impedance' variable that causes the departure frequency to decrease. Operating a larger aircraft (i.e., increasing the number of seats per flight) effectively results in a decline in total departure frequency.

Table 6. 2SLS Estimates of Capacity Utilization and Frequency

	Load Factor		Frequency	
	March	August	March	August
Log passengers no.	0.0978***	0.0804***	0.862***	0.837***
	-0.0069	-0.00524	-0.0124	-0.012
Any EA	0.0469***	4.41E-05	0.00051	0.0349
	-0.0166	-0.014	-0.145	-0.125
Log distance	-0.692***	-0.0544	-0.272***	-0.324***
	-0.177	-0.149	-0.0343	-0.0324
Log distance squared	0.0576***	0.00979		
	-0.0126	-0.0106		
Log aircraft size			-0.697***	-0.598***
			-0.0475	-0.0389
Constant	5.148***	3.323***	2.143***	2.311***
	-0.618	-0.514	-0.372	-0.366
Observations	3,956	3,915	1,536	1,561
R-squared	0.385	0.331	0.935	0.957
Country Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Note: Standard errors: *** p<0.01, ** p<0.05, * p<0.1

6 Conclusions

The international air transport is being transformed. The movement of the aviation industry's centre of gravity towards Asia, the emergence of long-haul inter-continental LCCs and questions over the competition effect of global alliances have all reignited the interest on the issue of liberalization in aviation. These developments have presented European regulators with the challenge to balance fair competition concerns with the push for multilateral liberalization of the aviation industry which they have championed for decades. Other than few anecdotal studies arguing for or against further opening of EU's international aviation market, there is a scarcity of academic papers on the economic effects EU's external aviation policy.

In order to fill this gap, this paper examined the economic effects of EU's external aviation policy by studying country-pair markets between EU28 countries and 27 external partners. Passenger demand, fare, frequency and load factor models were estimated in order to analyse the causal effects of the policy in reducing fare and improving service quality and capacity utilization. The results show up to 20% decrease in the average base fare when an agreement with the EU to open the market exists. The changes in fares subsequently stimulated an increase in passenger volumes of 27%. We find that carriers that operate in routes governed by the agreements have higher capacity utilization.

However, our analysis of the effect of the policy on frequency did not identify a statistically significant effect. The individual effects of the three types of EU's external aviation policy, however, led to some counter-intuitive results. The difficulty of finding suitable countries for comparison with the counter-factual and the lack of disaggregated data may pose some limitations to the interpretability of the results. The overall evidence is nevertheless strong enough to suggest that the liberalization of the external EU aviation markets had a clearly beneficial impact on aviation activity and consumer welfare. It is also safe to conclude from the results that further liberalization can bring additional gains to both the aviation industry and the economy as a whole.

Admittedly, there will always be winners and losers in a competitive air transport market as in any other industry. The growing competition between the various market players at global level may, in addition, raise additional concerns as regards the role of policy intervention in the aviation industry. Future research can enrich our understanding on these issues by looking at the welfare effects of EU's external aviation policy by looking at economy wide effects of the policy including its effect on air cargo.

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