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Abstract

In the present era of dramatic changes in the air transport services sector, this paper examines the link between the extent of liberalization and the performance of the Egyptian airline market. The study is conducted at the route level, and due data unavailability it is limited to the biggest Egyptian carrier, namely EgyptAir. Estimation results show that air liberalization reduces EgyptAir's fares but have two conflicting effects on its number of passengers. A direct negative impact on EgyptAir's number of passengers due to their switch to other carriers and an indirect positive effect due the reduction in fares. Simulations show that the net effect on the number of EgyptAir's passengers is negative. However, the decrease in the number of EgyptAir's passengers does not mean a decrease in the number of passengers to and from Egypt. Even with a constant income, the number of passengers to and from Egypt might increase if competition results in lower fares for all carriers. Some of the existing passengers just switch from EgyptAir to another carrier. Provided the other carrier is Egyptian (existent or newly created), the total revenues of travel to and from Egypt should not change for the Egyptian economy. In addition, simulation concludes that the consumer's surplus increases while that of producer declines; hence, leading to a net positive effect on society welfare. Therefore, if the aviation authority wants neither to waste the society welfare nor to create disincentive for the Egyptian producers to liberalization measures, it should adopt the liberalization measures with twin strategies: fostering effective entry of domestic carriers and fostering competition among these carriers.

ملخص

في هذا العصر من التغييرات الجذرية في قطاع خدمات النقل الجوي، تبحث هذه الورقة العلاقة بين مدى تحرير وأداء سوق الطيران المصري. وأجريت الدراسة على مستوى الطرق، وبسبب عدم توفر البيانات تقتصرالدراسة على أكبرناقل مصري، وهى شركة مصر للطيران. تبين نتائج التقدير أن تحرير سوق الطيران يقلل من ثمن التذكرة فى مصر للطيران ولكن لديه تأثيرين متضاربين حول عدد الركاب فيها: تأثير سلبي مباشر على عدد الركاب في شركة مصر للطيران بسبب التبديل على شركات الطيران الأخرى، وتأثير إيجابي غير مباشر بسبب الانخفاض في أسعار التذاكر. نماذج المحاكاة تبين أن الأثر الصافي على عدد ركاب مصر للطيران سلبي. ومع ذلك، فإن الانخفاض في عدد المسافرين على متن مصر للطيران لا يعني انخفاضا في عدد المسافرين من وإلى مصر. حتى مع وجود دخل ثابت، قد يكون عدد المسافرين من وإلى مصر زاد نتيجة المنافسة في انخفاض اسعار التذاكر. واذا فرضنا ان الناقل الآخر هو مصري (موجود أو تم إنشاؤه حديثا)، فينبغي الا يتغير اجمالي الايرادات من السفر من وإلى مصر بالنسبة للاقتصاد المصري. وبالإضافة إلى ذلك، تخلص الورقة إلى أن هناك زيادة فى فائض المستهلك في حين انخفاض فائض المنتج، وبالتالي يؤدي ذلك إلى تأثير إيجابي على صافى رفاهية المجتمع. ولذلك، ينبغي أن تعتمد السلطة المختصة بالطيران بعض تدابير تحرير سوق الطيران والتي لديها استراتيجيات مزدوجة: وهى تعزيز الدخول الفعال لشركات الطيران المحلية والمنافسة بين تعزيز هذه الناقلات حتى لا تضيع رفاهية المجتمع ولا تثبط همم المنتجين المصريين من ناحية تدابير تحرير سوق الطيران.

1. Introduction

The global integration has accelerated the evolution and the widespread of the air transport services sector; indicating more international tourism, more business and investments, more need for cross-borders trade and exchange. To reap from these benefits, there is an urge to improve the performance of the air services sector. In this context, this paper studies the impact of air services liberalization on its performance in Egypt.

A number of papers investigating the impacts of airline industry's structure on its economic performance have been published (e.g. Albers et al., 2005; Brueckner, 2001; Micco and Serebrisky; 2006 and Oum et al. 2000). They show that the issue is a major concern because the airline framework can have important effects on fares, profits, consumer welfare and labor and non-labor mobility.

Despite the high importance of the performance of airlines for economic integration and growth, Egypt Empirical research investigating the impacts of the air agreements on the Egyptian air services sector's performance is very limited. The papers that were done on Egypt are mainly ex-ante studies; they predicted the impact of deregulating the airline industry prior to deregulation (Ragab, 2005; WTTC, 2005). Few papers conducted ex-post studies estimating the impact of the deregulation after its implementation, at the country level (Marouani and Munro, 2009; Bottini and Marouani, 2009).

The present study seeks to fill the gap in the literature on Egypt in studying the liberalization of its air services sector. The paper performs an ex-post analysis; investigates the impact of the current passengers' airlines conduct (e.g. agreements, alliances etc.) on the performance of the industry (number of passengers, airfares, and welfare) in Egypt, per air route.

For the analysis, we adopt an extended version of the well-known **Structure-Conduct-Performance (SCP)** framework, which postulates that the direction of causality might run on two directions. First direction is that on the structure of an industry determines firms' conduct, which, in turn, determines performance. Second direction is that the performance may allow a firm to affect the market structure.

In exploring the impact of agreements on performance, the paper has two additional contributions to the existing literature. First, it addresses the issue per route. Second, it constructs an Openness Index (OI) that should reflect the degree of openness on each route. Since the indicator will not only be analyzed for its own interest but also used in econometric estimation, it should be quantitative. However, the main provisions of the agreements have qualitative nature. We apply an original statistical approach to summarize the qualitative information into a quantitative indicator summarizing these provisions with respect to competition.

A theoretical model is presented to highlight the main mechanisms at play in the Egyptian airline market. This model has two main testable implications. First, higher degree of air liberalization unambiguously reduces the airfares paid by consumers. Second, higher degree of air liberalization has two opposite effects on the number of passengers for a given carrier. It reduces the number of passengers for a given carrier due to more competition but increase such number due to lower average fares. The net effect is an empirical question. The estimation results confirmed the two main implications, using Ordinary Least Squares (OLS), Two Stage least Squares (2SLS), and Generalized Method of Moment (GMM).

In addition, using simulation under the assumption of more liberalization, the results show that the consumer's welfare increases, while the producer's welfare declines. Fortunately, the consumer's welfare effect outweighs the producer's welfare effect, leading to positive society's welfare.

The paper is organized as follows: after the introduction, and review of the conceptual and empirical literature, Section III provides the background information of the Egyptian Airline Industry. Section IV analyses the economic performance of the industry at the macro and micro level. Section V introduces the construction of the Openness Index, and describes the model used. Section VI explains the estimation results, and finally, section VII concludes and provides policy recommendations.

2. Literature Review

2.1 Theoretical

As a response of airlines to changing economic and regulatory conditions, alliances among airlines developed and became common in the aviation industry. Most papers analyzing the impact of alliances (conduct) on the performance of the airline industry use the **Structure-Conduct-Performance SCP** framework. The first set of studies assumed that **market structure is unchanged**. Brueckner (2001) was among the first authors to examine theoretically the effects of alliances on traffic level and welfare using linear demand and linear marginal cost functions. The author pointed out that an alliance would reduce competition in gateway (or inter-hub) markets that were previously served by the partner airlines. However, cooperative pricing under an alliance would increase traffic in connecting markets since portions of a connecting trip are complements.

Beside alliances between airlines, the ones between airlines and airports play an important role in the industry performance in terms of long-term competitive advantage. Albers et al. (2005) explored the potential for this kind of cooperation and identified its fields of capacity, marketing and security. These allow benefits in terms of reduction of uncertainty and extraction of relational rent for the partners. However, it may be expected that a preferred treatment of one specific airline would lead to a perceived discrimination of other airlines as customers of the airport in focus.

Even rivalry between alliances is crucial for economic welfare. Zhang and Zhang (2006) built a model where each alliance member maximizes its own profit and a share of its partner's profit. A complementary alliance confers a strategic advantage by allowing the partners to credibly commit to greater output, owing to both within alliance complementarity and cross-alliance substitutability. They found that alliances tend to improve economic welfare but an alliance that arises purely due to the threat of entry may reduce welfare. Finally, rivalry between complementary alliances tends to enhance economic welfare.

Other studies in this field have relaxed the assumption of **unchanged market structure** to examine the **impact of performance on market structure**. Lin (2005) focused on the impact of alliances on entry. He considered a hub-spoke network which links three cities by one direct international and one direct domestic flight. One major carrier provides both flights, while another foreign carrier provides the direct international flights as well. Due to airline deregulation, there exists a potential entrant in the domestic market. Under this network, he shows that international code-sharing alliances between the two incumbent carriers may play a significant role on deterring entry in deregulated domestic markets.

Latter, Lin (2008) extended his analysis to a network of n cities, so that various-sized networks can be analyzed. Still focusing on code-sharing alliances and on entry deterrence, he considered one major carrier operating a network with one hub that links n cities. The major carrier competes with a foreign carrier on one international spoke, while the other spokes are domestic and monopolized. There exists a potential entrant on one of the domestic spokes. The author shows that entry may increase or decrease the major carrier's profits, depending on the network size and the degree of product differentiation. When entry

decreases the profits, an alliance between incumbents can be used as a credible threat to deter entrants that does not have a significant cost advantage.

2.2 Empirical

2.2.1 Overview Empirical Literature

In testing above-mentioned predictions, Brueckner (2003a) used data from the Passenger Origin and Destination Survey 1999, provided by the US Department of Transportation (DOT). The paper measures the separate impacts of alliance membership, code-sharing, and antitrust immunity on the fares charged for interline (multi-carrier) trips in a large sample of international city-pair markets. The empirical results show that alliance membership and code-sharing lead to notable reductions in interline fares, and that antitrust immunity[1] has an even larger beneficial effect. Thus, the results suggest that cooperation among international carriers generates substantial fare benefits for interline passengers.

In addition, Brueckner (2003b) extended his study and used these estimated fare impacts to compute aggregate dollar measures of the gains to Star Alliance[2] passengers from cooperation among the partner airlines, as of 1999. The results show that, together, these three forms of cooperation lead to a substantial 27 percent reduction in interline fares. The paper then computes the separate benefits from antitrust immunity and code sharing for the Star Alliance's interline passengers. The immunity enjoyed by the Star partners generated an aggregate benefit of about $80 million per year for interline passengers in 1999. Code sharing among Star partners yielded a further annual benefit of around $20 million.

Studying the effects of major alliances on outputs and consumer welfare, Oum et al. (2000) found that all alliances, in North Atlantic markets, taken together increased capacity by some 36,000 passengers annually, as well as witnessing decreasing fares by an average of $41 on routes served by the alliance carriers. Consumers were better off as a result. The main source for fare reduction according to Oum et al. (2000) is the cost reduction following the formation of an alliance. Although mark-up rose for some alliances, the reduction in marginal cost outweighed the increase in mark-up, leading to lower fares. In some cases, alliances could make the markets more competitive by, for instance, strengthening the weak carriers who would otherwise fail.

Distinguishing parallel and complementary alliances show, however, that an alliance of complementary type is likely to reduce fares whereas a parallel alliance is likely to increase airfares. Also, they examined stock price reactions to an alliance showed that the alliance tended to increase the (expected) profitability of allying carriers while decreasing the profitability of non-allied carriers. International alliances appeared to improve the partners' competitiveness and in turn threaten the rivals' competitive positions.

In a comprehensive study in terms of geographical coverage and type of arrangements (Open Sky Aviation[3], alliances etc.), Piermartini and Rousova (2008) used a gravity-type model to estimate the impact of liberalizing air transport services on air passenger flows for a sample of 184 countries. The index reflecting the degree of liberalization is the one computed by Gonenc and Nicoletti (2000). They found robust evidence of a positive and significant relationship between the volumes of traffic and the degree of liberalization of the aviation market. An increase in the degree of liberalization from the 25th percentile to the 75th

[1] It is designed to allow the partners to collaborate in pricing decisions, enhancing their ability to function as a single airline.

[2] It was founded in 1997 by five of the world's leading airlines: Air Canada, Lufthansa, Scandinavian Airlines, Thai Airways International and United Airlines. Then, it quickly expanded to include 27 member airlines, by 2010. In Brueckner (2003b), the analysis covered data in 1999, where the alliance comprised 8 member airlines.

[3] An international policy concept, which calls for the liberalization of rules and regulations on international aviation industry, especially commercial aviation - opens a free market for the airline industry.

percentile increases traffic volumes between countries linked by a direct air service by approximately 30 percent. The authors also investigate the impact of the various components of the index of the degree of liberalization. They find that the removal of restrictions on the determination of prices and capacity, cabotage rights and the possibility for airlines other than the flag carrier of the foreign country to operate a service is the most traffic-enhancing provisions of air service agreements.

2.2.2 Empirical Literature on Egypt

Despite the importance of questioning the effectiveness of the airline conduct on its performance, empirical studies on Egypt are limited if not lacking.[4] Marouani and Munro (2009) assessed trade and domestic barriers to air service provision on MENA countries by constructing an aggregated and modal trade restrictiveness index at country pair level (TRIs), based on information gathered from detailed questionnaires and country reports prepared by local consultants covering three modes: cross border trade, commercial presence and the presence of natural resources[5]. The conclusion highlighted that although Egypt softened its constraints on foreign equity participation, it still has the highest restrictiveness level than Jordan, Lebanon and Morocco because of its highest restriction levels in the cross border trade and commercial presences modes. The analysis in this paper is conducted at the country level while the route level is more relevant because the framework in which airlines are operating differs highly depending on the routes. We address this shortcoming by constructing the Openness Index -this is just the opposite of RI- at the route level that covers only two modes: the cross border trade and the commercial presences modes

Examining the effect of barriers to service provision on the number of passengers and the airfares is especially important for the tourism sector in Egypt. Massouad et al. (2009) were interested in analyzing the tourism sector, its real economic impact and its potential, and whether tourism is yet a relatively restrictive business that requires further liberalization actions. In line with the above findings, the paper showed that among other restrictive measures, the airline industry's barriers constrain Egypt's tourism from reaching its potential. Using the tourism demand function and the parameters of Egypt's competitive locations as an average, the study estimated that Egypt could have attracted 20-28 percent more tourists over the period 1995-2007, with air liberalization measures. Searching for tourism source countries with unexploited tourism Potential, for instance Egypt can increase inbound tourism from Saudi Arabia, France, and Germany by 77, 29 and 20 percent, respectively. According to WEF (2008), one of the main constraints to tourism potential in Egypt is the relatively poor airport density[6] with a rank of 117 out of 130, compared to Jordan and United Arab Emirates with rank of 80 and 31, respectively; which discourages tourists from visiting Egypt. Hence, working on the expansion of airport facilities, the national carrier's fleet (EgyptAir) and permission of chartered operations between two points not directly served by national "air companies" or foreign source countries are strongly needed, to avoid current congestion, improve quality of services in airports and airlines, and to ensure easy access to "targeted" destinations. However, we cannot ignore the effort devoted by Egypt in attempt to improve air services provision by expanding airports facilities (see section III).

[4] Here, we focus on studies dealing with air passengers. For an example of studies dealing with freight, see Micco and Serebrisky (2006).

[5] Cross border trade mode includes open skies agreements, freedom of the air, charter flights, low-cost flights, cabotage, gate slot allocation, airline alliances, and non-resident suppliers. Commercial presences mode include foreign ownership in the provision of international and domestic scheduled services, public ownership, cabotage, airport ownership, CRS and selling & marketing, and repair & maintenance. Movement of natural persons relates to the supply of services by an individual from the country of the supplier in the country of the consumer.

[6] This variable provides the number of airports with at least one scheduled flight in 2006 per million of population.

Most of conducted studies on the number of passengers and the airfares in Egypt are ex-ante. A report conducted by WTTC 2005 (Oxford Economic Forecasting's Tourism Satellite Account (OEF)) introduced its projections on the impact of liberalizing air transport on airfares in Egypt, for the period 2005-08. Using the results reported in a US Department of Transport study looking at the liberalization in the transatlantic market; this report projected that liberalization in Egypt would reduce average airfares by 12 percent over the period 2006-09, relative to a non-liberalized scenario. Then, combining this assumption with the price elasticity of demand on holiday and business travel of -1.9 would give that international arrivals could increase by approximately 22 percent. However, this report explains neither the methodology used for the estimation of airfares nor which other factors are used.

Ragab (2005) performed a qualitative study assessing the merits of deregulating the airline industry on tourism in Egypt. It outlines three options to maximize the benefit of the Egyptian economy from deregulation; first to continue deregulating all Egyptian airports except Cairo International airport, second to deregulate all airports including Cairo International airport, and third to implement bilateral agreements for open skies between Cairo International airport and countries selected by the civil aviation authority. This paper concludes that the third option is the best option, but its success depends on some necessary institutional reforms such as easing the establishment of new companies and new entrants in the aviation market to increase the private sector participation, the implementation of the law of protection of competition and the entrance of Egyptian companies with strong companies in marketing alliances to expand the network and the seating capacity.

Moreover, Piermartini and Rousova (2008) conducted a study covering approximately 2,300 country-pairs involving 184 countries (including Egypt). Using the gravity model, the paper found robust evidence for a positive significant relationship between the removal of air services restrictions on the determination of prices and capacity, and passenger traffic. For low-income countries, they found that the rise in the index of air services liberalization by 1 percent increases passenger traffic by 12 percent. When working on the observations of passenger traffic between high-income countries, the percentage increase of passenger traffic rises to 24 percent. This demonstrates that although low-income countries' agreements have positive and significant impact on passenger traffic, it is weaker than in high-income countries.

The results of this study have three limitations that will be overcome in our analysis. First, it does not distinguish between the country of origin and the destination country. Arab countries do not have the same potential for tourism and such a distinction might be informative. Second, estimation is conducted assuming that the coefficients are the same for, let's say, Brazil and Algeria, which is questionable. Third, it neglects countries located at a distance below 5000 km. In a potential common Arab tourism policy, airlines covering less than 5000 km can still play an important role especially if land transport is deficient.

Adler and Hashai (2005) demonstrated, given existing socio-economic indicators, the potentially positive impact of deregulating the air-traffic industry in the Middle East on increasing inter-regional passenger demand flow by upwards of 51 percent using the transformed linear model or 73 percent using the gravity model. Beside some technical problems, the study suffers from two major flaws. First, it combines coefficients estimated on a European sample with the value of the explanatory variables pertaining to the region to estimate intra-regional passenger flows. It is questionable whether Danishes behave (as reflected in the coefficients) like Yemenites. Second, the study focuses only on intra-regional passenger flows while the ones from outside the region are more important.

Our study aims at filling the gap in the empirical literature on air transport services in Egypt. It investigates the impact of the airline industry's conduct (open skies, alliance, etc) on its

economic performance. The variables that measure the performance are the revenue passengers, and airfares. Also, the study conducts its analysis at the route level, which gives richer information than just running the analysis at the country level. In addition, the study simulates the impact of the performance of more liberalized air environment on the welfare of consumer, producer, and society.

3. Egyptian Airline Industry's Background

3.1 Structure (ownership, management, regulations, etc)

This section gives a background about the structure of the Egyptian Aviation market: how many domestic airlines companies in the market; their activity, to what extent foreign companies are allowed to operate; how many Egyptian airports provide and facilitate air traffic movement and their relative importance.

Concerning air carriers, according to decree 1/1989 article number 122, the domestic private sector is allowed to provide international and domestic scheduled and non-scheduled services with 100 percent equity.[7] However, the Egyptian Civil Aviation market is highly protected domestically. Although there are 10 current domestic airline companies permitted to work in the market by law (Table 1), the air services in Egypt is practically dominated by only one national flag carrier namely EgyptAir. Although AMC should be active in the scheduled domestic and international passenger flights, for the time being, they only provide non-scheduled passenger flights domestically and some destinations in North Africa, Middle East and the Gulf Area.

Concerning EgyptAir, it has a market share of more than 95 percent in 2009. Though it is a 100 percent government owned holding, it did not take any state aid though not forbidden by law; it profiles itself as "self finance status without any government subsidy" and state aid is "not under discussion". Also, it has stakes in Air Cairo (60%), Smart Aviation Company (20%), and Air Sinai (100%). There was a plan considering for 20% private ownership of EgyptAir, but no timeframe has been set. If this happens, it is expected to open up possibilities for successful full privatization and, in its wake, more competition.

As mentioned above, officially there is no monopoly position of the flag carrier (EgyptAir).[8] Privately owned Egyptian companies, namely AMC should be active in the scheduled domestic and international passenger flights, though for the time being they only provide non-scheduled passenger flights domestically and some destinations in North Africa, Middle East and the Gulf Area. In practice, only EgyptAir operates domestic and international services. Also, EgyptAir's subsidiaries, Air Cairo[9] is active in operating domestic and international charter services and EgyptAir Express used to operate domestic and regional services under EgyptAir until it is separated from EgyptAir in 2008. The privilege of EgyptAir in the market goes to the extent that it is possible that when new (certainly intercontinental) route rights are acquired, EgyptAir will be considered by the Egyptian authorities to be "first in line" as the incumbent airline with the largest fleet and network. Indeed, for the foreseeable future AMC won't be able to operate long distance equipment. EgyptAir has 66 fleets[10], compared to 5 fleets operated by AMC[11]. However, the Egyptian Civil Aviation Authority has been working on expanding the market by lowering the capital required for entering the market. Hence, new private airline companies are under construction to operate scheduled and/or non-scheduled domestic and (if) international flights (Annex 1).

[7] Article no. 122 in Executive decree 1/1989

[8] Article no. 122 in Executive decree 1/1989

[9] EgyptAir acquires 60 percent of the airline.

[10] EgyptAir website

[11] http://www.ch-aviation.ch/airlinepage.php?code1=KHH

Concerning foreign carriers, the Egyptian airline sector started gradually liberalizing and deregulating measures since mid-nineties, by allowing chartered operations between two points not directly served by national "air companies" or foreign source countries. [12] Charters were allowed to land in all Egyptian ports with the exception of Cairo Airport. By 2000, decree 375 allowed foreign firms to conduct in Egypt regular and irregular international flights from four airports in Egypt, except Cairo Airport. According to decree 1176 of 2001, all Arab airlines were allowed to conduct scheduled and non-scheduled international flights between Egypt and Arab countries and permitted landing in all Egyptian Airports, except Cairo Airport (Ragab, 2005). By 2005, several decrees announced lowering capital required for firms working in scheduled and non-scheduled flights, allowing foreign companies to provide international and domestic scheduled services up to 40 percent, but for non-scheduled services they are permitted to own 100 percent of equity. But, in general, it is not allowed for foreign passengers to be carried between two countries by an airline of a third country.

Regarding Egyptian Airports, till 2009, Egypt has 20 airports running domestic and international flights (Annex 2). All these airports are state owned, except Marsa Alam and Alamein are under Build-Operate-Transfer (BOT)[13]. There are primary six airports: Cairo Int'l Airport, Sharm-el-Sheikh, Hurghada, Luxor, Alexandria and Aswan. Their importance differs with the number of flights they provide and the number of passengers they can carry. The most important airport is Cairo Airport; it has most of air traffic movement in Egypt. It has 44 percent of the flights arriving to and departing from Egypt in 2009, leaving the rest of flights to the other airports. This shows that Cairo airport is the main destination for many foreign carriers. The importance of Cairo airport increased even more after becoming the major hub for Star Alliance that connects the Middle East, North Africa and Europe and a gateway for the Middle East, North Africa and Europe as well as a handful of long-haul destinations in Asia and North America. In an attempt to ease the flight of passengers in Cairo airport, the Egyptian Ministry of Civil Aviation began construction of Terminal 3 in 2004 that was opened for commercial operations in 2009. The facility of this terminal is twice as large as the other two terminal buildings combined, with the capacity to handle 11 million passengers annually. In addition, the new Terminal's design will help EgyptAir and its Alliance partners reduce transfer time between flights to just 45 minutes, regardless of whether the transfers are domestic, international, or a mix of the two.

However, one cannot neglect the role of the other airports. Their share to total operated flights still satisfactorily: 20 percent Sharm El Sheik, 19 percent Hurghada, 7 percent Luxor, 4 percent Asswan and 3 percent Alexandria. This urges the Egyptian Ministry of Civil Aviation to work on improving the capacity of these airports, its services and facilities, as it worked on the Cairo airport.

Although Egypt has liberalized certain international airports, allocating gate slots by auction, Cairo's gate slots remain under the control of EgyptAir. This reflect the outstanding importance of Cairo Airport which places restriction on charters and low-cost flights to take place at Cairo Airport until they get the approval from the dominant national carrier EgyptAir. This restriction aims at protecting national carrier from any potential competition.

3.2 Agreements

In 1978, world airlines started to liberalize air transport industry through setting up agreements; for instance, the United States of America (USA), the European Countries (EU),

[12] Decree 52 in 1996

[13] A type of arrangement in which the private sector builds an infrastructure project, operates it and eventually transfers ownership of the project to the government.

the Association of South-East Asian Nations (ASEAN), the Arab Civil Aviation Council (ACAC) and Arab Air Carriers Organization (AACO).

Egypt started expanding and liberalizing its air services, during the 1980's, in the context of globalization by setting up bilateral agreements and alliances at the regional and global level; aiming at strengthening its competitive position.

The Egyptian Aviation market is represented by EgyptAir that dominates more than 95 percent of the domestic market compared to domestic airlines and 52 percent in the international market compared to foreign airlines. In 2009, EgyptAir had 9 domestic destinations, and 64 international destinations: 21 destinations in Europe, 16 in Africa, 8 in Far East, 2 in North America and 17 in Middle East (Annex 3)**.** However, it is still working on expanding its market share by signing agreements regional and global agreement. It succeeded in being a party in 123 bilateral Air Service Agreements. From them, 28 agreements are enforced: 11 are with European countries, 9 with Asian Countries, 7 with Africa, and only one agreement in North America. Also, it increased its code share agreements: it has 20 code shares with major foreign airlines (Annex 4) [14]. Such agreements enable reaching new markets that were not reached previously and thus increasing revenues. In addition, it is a member in STAR Alliance with 26 international airlines since 2008: 20 airlines out of them are in code share agreements.

In the context of Arab regional integration, despite many attempts by the Arab Civil Aviation Council (ACAC) and Arab Air Carriers Organization (AACO) since 1999, this integration did not take place until 2006. In Rabat 1999 the Arab Civil Aviation Council (ACAC) and Arab Air Carriers Organization (AACO) have agreed that bilateral OSAs should be started among Arab countries to facilitate the implementation of a multilateral agreement approach by the end of 2003. They had also decided to sign a plan to achieve this objective and to have a yearly evaluation to its application where it should be reviewed in order to reach a final open skies agreement. Unfortunately, this integration did not achieve its aims.

In addition, ACAC prepared a regional arrangement for gradual liberalization into four stages, starting in November 2000 and ending by November 2006 with the liberalization of the fifth freedom which concerns the right of an airline in one country to carry traffic between two countries outside its own country of registry as long as the flight originates and terminates in its own country of registry.

Unfortunately, arrangement dates were not respected. Instead some countries unilaterally declared OSAs in some or all airports. Others have entered the scene with bilateral agreements either between Arab or with other non-Arab countries, such as the case of Jordan, Egypt and Morocco.

At last, EgyptAir successfully joined an Arab integration project called ARABESK in 2005. It is an unofficial voluntary cooperation agreement among 9 Arab airlines[15] under the auspices of the AACO. The project was activated in January 2006 having several commercial aspects and means of co-operation among its members, such as coordinating schedules, reduce duplication on routes and link the destinations network of members, which stretches from North America to East Asia, followed by commercial agreements such as code-shares,

[14] EgyptAir Airline, Report Year 2008/09;
http://www.egyptair.com/English/Annual%20Reports/EGYPTAIR%20Airlines.pdf

[15] EgyptAir, Saudi Airlines, Gulf Air, Yemen Airways, Royal Jordanian, Middle East, Tunisair, Syrian Air, and Ethihad Airways.

special prorate agreements[16] (SPAs) targeting to reach full commercial co-operation among the members; hence, boosting market share.

Regarding Africa, Egypt joined COMESA[17] in 1998 aiming at a fully integrated, competitive African regional economic community. One way to achieve this was to introduce a liberalization program for the air transport services. The program was introduced in two phases' implementation. Phase one involves free movement of intra-COMESA cargo, non-scheduled passenger services, and scheduled passenger services with frequency limit of up to two daily frequencies between any city pairs, adoption of multiple designation, elimination of capacity restrictions, and granting of fifth freedom traffic rights restricted to 30 percent on routes where third and fourth freedom traffic rights are provided and unrestricted where there are neither third nor fourth freedom traffic rights services. Phase two aims at permitting the ownerships and control of air carriers and the relaxation of intra-COMESA cross-border investments by air transport services and infrastructure such as airports, aircraft maintenance facilities, air carriers, and fifth freedom traffic rights shall be granted without restrictions; simply Free movement of intra-COMESA air transport services.[18] Phase one has been implemented by its time in 2000, while phase two is still on delay.

At the global level, EgyptAir signed a bilateral agreement with Canada Air in 1987 with single disapproval tariffs[19] and pre-determined price and capacity[20], but the agreement is not definitely in force[21]. EgyptAir was aware that Europe is a very profitable destination and that it wants to operate in its airports without restrictions, while European airlines are only allowed to operate limited services to Cairo. Hence, starting 2006, EgyptAir signed bilateral agreements with some European countries. For instance, EgyptAir signed a bilateral agreement with Belgium and Greece, in 2007. But these bilateral agreements, in many instances, contain restrictive provisions with respect to frequencies and/or capacity. Even if Egypt declares to be in favor of removing artificial barriers to more flights, few progresses have been made recently.

Most of the bilateral Air Service agreements ASAs of EgyptAir include the third and fourth freedoms, but the fifth freedom is not generally allowed (see, Box 1).

Aware of the fact that joining an alliance will ease the access of the routes that are restricted or limited in access more than bilateral agreements, EgyptAir worked on increasing its capacity and modernize its equipment until it succeeded in joining one of the three major alliances[22] around the world STAR Alliance in June 2008, to become the 21st member. This alliance contains 20 airline companies (Annex 5) from the most significant companies in the world. Star Alliance network has 160 countries with 916 destinations, daily departures of 17 thousands and daily code share flights of 18 thousands. As a consequence, this expands the network of EgyptAir globally, by increasing the number of destinations that it is allowed to access without restriction as before the alliance[23], increasing its scheduled flights. This would

[16] Under a special prorate agreement, each of the two carriers specifies the revenue it requires to carry a passenger along its portion of an interline trip ticketed by the other carrier. The ticketing carrier then sets the overall fare for the trip, recognizing that the required amount must be paid to the collaborating carrier (Brueckner, J.K. (2003a).

[17] Common Market for Eastern and Southern Africa. It includes the following countries: Angola, Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

[18] Aviation in transition: challenges and opportunities of liberalization; the COMESA air transport liberalization experience, Amos Marawa, 2003, seminar prior to the ICAO worldwide Air transport conference. http://programmes.comesa.int/

[19] It means that a tariff proposed by a designated air carrier of either country, that is a party to a bilateral air agreement, does not come into effect, or remains in effect, if the aeronautical authorities of either country are dissatisfied with it.

[20] http://www.th.gov.bc.ca/OpenSkies/documents/081227_IITL_Appendix.pdf

[21] http://www.otc-cta.gc.ca/doc.php?did=132&lang=eng

[22] STAR Alliance, Sky Team, and OneWorld

[23] http://www.staralliance.com/en/about/airlines/egyptair/; EgyptAir report 2007

provide more access to Europe (for EgyptAir itself) and to the US in the first place through the alliance's network. Also, given that EgyptAir does not meet any domestic competition, this alliance works significantly in enhancing the airline's competitive stance in the international long-haul markets. In addition, the alliance will improve the efficiency of Cairo International Airport Terminal 3 as it is one of the major hubs for the alliance, and also increase the number and frequency of the other member in the alliance (e.g. increase its flights to 10 flights per week to Cairo International Airport).

4. Egyptian Airline Industry's Economic Performance

4.1 The Egyptian Aviation Market

This section investigates the performance of air traffic movement and airport in the Egyptian Aviation Market. For the period 2004/05-2007/08, Egypt profits yearly from larger air traffic movement, with slight decrease in the last fiscal year 2008/09 due to the financial crisis. The number of passengers grew with an average annual growth of 8 percent for the period 2004/05-2008/09. From 2004 to 2006, there was a stable growth of 4 percent annually. Then, the number of passengers grew by 19 percent in 2007 and 17 percent in 2008, from 26 million to 31 million then 36 millions in 2006, 2007 and 2008, respectively. Due to the negative impact of the global financial crisis, the number of passengers decreased by 3 percent in 2009 to 35 million (Figure 1, left) (Egyptian Holding Company, 2010)

Analyzing the Air traffic movement by international and domestic market in Egypt, we notice that the international air movement was the main driver of the air movement trend, while the domestic market was stable (Figure 1, right). For the period 2004-2009, on average, international passengers are approximately four times the numbers of domestic passengers and international flights are double the domestic flights. On average, the ratio of international passengers to total passengers was 79 percent and the ratio of international flight to total flights in Egypt was 65 percent. Moreover, the international and domestic passengers grew by 9 percent versus 3 percent, on average for the same period, respectively.

As mentioned above, Cairo International Airport has the most critical role as it controls more than one third of air traffic movement. For the period 2004-2009, on average, it served 41 percent of the passengers coming to and departing Egypt (Figure 2, left). As to international passengers, Cairo International Airport serves about 33 percent, on average, compared to 18 percent for Sharm El Sheik and Hurghada, and only 4 percent and 2 percent in Luxor and Alexandria, respectively (Figure 2, right).

Regarding efficiency, the Egyptian Aviation market increased its capacity utilization, captured by the passenger load factor (PLF)[24], gradually and slowly. It rose from 60 percent in 2000 to 64 percent in 2008. Along this period, international flights had higher capacity utilization than domestic flights, 62 versus 49 percent on average. This could be attributed to two factors: first, the number of international flights' passengers is larger than domestic flights. On average, the share of international passengers to total passengers is 70 percent. Second, the distance flown is, obviously, longer for international than domestic trips. Also, Egypt has a PLF that is comparable to MENA countries; for instance, in 2008, Jordan, Morocco, and Egypt had 70, 65 and 64 percent capacity utilization, respectively.

To sum up, this section highlighted five main developments that took place in the industry for the period 2004/05-2008/09. First, the air traffic movement in the Egyptian Aviation market has been trending upward, except in 2008/09 due to the financial crisis (Figure 1). Second, it witnessed high growth rate, except 2008/09. Third, The Air traffic movement in Egypt was mainly driven by the remarkable increase in the international air movement, while the

[24] That measures how much of an airline's passenger carrying capacity is used; it is calculated as the total passengers kilometer to total available seats kilometer

domestic market was stable with very moderate rise if any. Fourth, the most important airport for most air traffic movement in Egypt is Cairo Airport, whether for the international or the domestic market. Last, Egypt still has to work on using its potential capacity efficiently.

4.2 The Egyptian Airline Industry-EgyptAir

After covering the performance of air traffic movement in the Egyptian aviation market, we turn to our focal point of analysis, investigating the performance of the Egyptian airlines companies. Since EgyptAir is the incumbent carrier in the Egyptian Aviation market that dominates the scheduled domestic and international air traffic movement, our analysis will only focus on it.

EgyptAir's number of passengers[25] witnesses an upward trend since 2004/05 till 2008/09, with the minimal increase in 2008/09 due to the negative impact of the financial crisis (Figure 3). Also, it has positive growth rate of passengers. But, the rate of growth decreased from 17 percent to 2 percent for fiscal years 2007/08-2008/09. Interestingly, the number of passengers did not attain negative growth rate, because the 10 percent growth of international passengers outweighs the -24 percent growth rate of domestic passengers. Observing international versus domestic passengers, the growth rate of international passengers have been increasing steeply since 2003/04 reaching its maximum growth of 24 percent in 2007/08, then growing by 10 percent in 2008/09. While domestic passengers' growth rate was unstable for the same period, then started declining significantly starting 2007/08, to reach its minimum rate of growth -24 percent in 2008/09 due to EgyptAir Express expanded its network domestically in summer 2008. The difference in the performance of international and domestic passengers is understandable in light of the annual growth of Hajj and the Egyptian workers coming from Arab countries.

What is the distribution of EgyptAir's passengers? This is what matters in the sake of knowing the potential profitable destinations for the company. On average, for the period 2005/06-2007/08, the highest passengers' growth rate was in the Far East, followed by Africa, America, Middle East and Europe with 27 percent, 18 percent, 15 percent, 12 percent and 8 percent, respectively. We could not take the average including fiscal year 2008/09 as it witnessed the financial crisis that erratically changed the yearly growth rate per region. As shown in (Figure 4), the Far East had jumped in its growth rate till 2007/08 followed by a severe cut, from 33 percent to 2 percent in 2007/08 and 2008/09, respectively. For America, although it has a stable growth rate around 14 percent, its growth rate dampens to -1 percent in 2008/09. EgyptAir's scheduled passengers to Europe have been decreasing, and then they rose 11 percent in 2006/07 and 18 percent in 2007/08. Due to the financial crisis, though the number of passengers is still increasing, its rate of growth declined by 7 percent in 2008/09. The performance was better for Africa and the Middle East, respectively, during the crisis. Africa is the only destination region that is very lucrative to EgyptAir, as it is the only region with growing number of passengers, even in the year of the crisis. Concerning the Middle East, it has a modest contribution to the number of passengers carried by EgyptAir, and its growth rate decreased from 14 percent to 11 percent, in 2007/08 and 2008/09, respectively.

The financial crisis in 2008/09 hit mostly the American, European and Asian countries. This explains the reduction in their figures. The Middle East and Africa were not very much affected because they are not extensively globally integrated. Passenger numbers to/from the Middle East grew by 11 percent in 2007/08-2008/09 compared to 14 percent in 2006/07-2007/08. But for Africa, its passengers' growth rate increased from 25 percent to 26 percent, in 2007/08 and 2008/09, respectively. This explains the change in the ranking of the regions in terms of their yearly growth rate of the number of passengers carried by EgyptAir to/from

[25] Our analysis for EgyptAir always refers to scheduled Air Traffic movement

this region before 2008/09 and in 2008/09 (Table 2). For example, the rank of the Far East after being the first, it turns to be the fourth destination to EgyptAir, changing its rank with the Middle East for the average period 2005/06-2007/08 and 2008/09, respectively. This indicates that if EgyptAir focuses on Africa and the Middle East by setting up airline agreements with these regions airlines, it might smooth the negative impact of any crisis that takes place in the European and American Countries.

Regarding EgyptAir's market share internationally, it is operating efficiently in dominating a great share of main international routes. For instance, in 2008/09, in Europe, EgyptAir's Origin &Destination (O&D) market share on the route (Vienna-Cairo-Vienna) is 46 percent versus 52 percent to the Austrian airline, on the route (Paris-Cairo-Paris) is 46 percent versus 35 percent to Air France. Although EgyptAir has a high O&D market share, it still suffers from a gap of 22 percent in the first route, and 14 percent in the second route, indicating that EgyptAir has to increase its use of available capacity efficiently. In North America, on the route (New York-Cairo-New York), EgyptAir's O&D market share is 73 percent versus only 11 percent for EgyptAir's main competitor on this route. In Middle East, for example, on the route (Jeddah-Cairo-Jeddah) EgyptAir's O&D market share is only 27 percent versus 72 percent to Saudi Airlines. The gap in market share capacity on this route is 39 percent; this could be attributed to the restricted movement of EgyptAir in Saudi Arabia Airports[26].

All of the above shows that EgyptAir is performing on average satisfactorily, for the period 2004/05-2008/09. First, its number of passengers witnesses an upward trend, with the minimal increase in 2008/09. Second, the growth rate of international passengers has been increasing steeply till 2007/08, while domestic passengers' growth rate was unstable. Third, during time of economic stability, on average, the highest passengers' growth rate was in the Far East, Africa, America, Middle East and Europe, respectively. But in time of erratic negative events, Africa and the Middle East pioneered the best performing destinations. This suggests devoting more efforts in expanding its network regionally in Africa and the Middle East by enforcing bilateral/multilateral agreements.

5. The Economic Framework

As stated above, the analysis will be based on the well-known Structure-Conduct-Performance (SCP) framework, which postulates that the structure of an industry determines firms' conduct which, in turn, determines performance.

The framework was first introduced by Bain (1951) and has been much debated subsequently. Bain's (1951) seminal paper was based on the analysis of the performance of US firms in 42 industries in the latter half of the 1930's. He found that the rates of return of firms in the relatively more concentrated industries significantly exceeded those in the relatively un-concentrated industries. He interpreted this result as evidence for the SCP paradigm. Demsetz (1973) suggested an alternative explanation for the abnormal performance identified by Bain (1951). His argument was that the abnormal profits observed reflected the higher level of efficiency of firms, not the presence of collusive behavior and pricing.

Another questioning of the SCP framework concerned the nature of the causal links between the 3 components. The original SCP framework states that the **structure** of an industry determines firms' **conduct**, which, in turn, determines **performance**. However, the literature suggests that the direction of causality might run in other directions than the simple S ➔ C ➔ P. Subsequent development in industrial organization showed that the performance may allow the firm to affect market structure through mergers, acquisitions and other forms of concentration. This is well illustrated by the US airline market. Deregulation in 1978 led to

[26] EgyptAir data, unpublished

entry of numerous new carriers, which started intense competition with incumbents. Then, a wave of mergers and acquisitions followed and brought back market structure closer to the situation before deregulation.

An extended framework allowing for all the above-discussed interactions to operate served as a basis for the literature pertaining to the airline industry. Hence, our extended version of the framework allows for causality go either directions. The **structure** of an industry is reflected in the number and importance of players, producers and consumers, and on the institutional context. Firms' **conduct** concerns air transport services agreements such alliance, bilateral or multilateral agreements; and the type of agreements: complementary or parallel alliance[27]. The performance is measured by volume of passengers, fares, carriers' profit and welfare.

5.1 The Model

To illustrate the conceptual framework of the study, we consider the following simple model. There are 3 distinct countries (cities) indexed by the set of capital letters (A, B, C). Each country is linked by a single hub-city, denoted by the same letter at its country. Individuals living in each country wish to travel to other cities, and all travels are supposed to be round-trips.

The historical framework for airline traffic (before liberalization) has been a duopoly by route. In such framework, each incumbent carrier (i.e. Airline AA for county A) uses A as its hub to operate the whole network. The consumer from A can choose AA or AB for a travel (A-B). Due to the duopoly situation, the consumer is indifferent between the two except if there is a real difference in the quality of services. However, even in the historical framework the consumer from A had potentially a third choice (A-C, C-B) and it happened that (A-C, C-B) is preferred to (A-B). Denoting airline AA fares for (A-B) as FA-AB and abstracting from the quality of services, this means that FAAB > FCAC + FCCB. However, such a third choice was relatively rare.

With the possibility of signing airlines agreements (e.g. alliances, OSA etc.) the third choice became much more likely. This is because the agreement could affect, in particular, FA-AB, FC-AC and FC-CB. Actually, one can even imagine a new fare denoted FC-AB, going from A to be B using carrier AC, which is lower than FC-AC + FC-CB.

To accurately take account of such complex interactions, the analysis cannot be limited to the carriers and the country levels but should take account of the route level too. Moreover, the demand for air travel depends upon fares but also on frequencies and other service attributes such as the level and quality of air and airports services delivered. Airlines agreements might have an effect also on these factors. Hence, even without a change in fares, agreements may change consumers' preference for a given carrier. The final outcome depends on the type of agreement, consumers' utility and the strategic interactions between the various actors (carriers, airports and governments).

From the above discussion, it follows that passengers coming to Egypt will have different choices. Some will take direct flights, others will take indirect flights and for the same itinerary some will travel with EgyptAir while others will prefer another carrier (regular or low cost). To model such diversity in consumers' choice, it is now traditional in economics to use the Dixit-Stiglitz model. The model considers a representative consumer faced with a variety of products and who choose the basket (composed of each variety), which maximizes his/her utility. The representative consumer's decision is, actually, reflecting the choice of the whole set of passengers to Egypt.

[27] Parallel alliance refers to the collaboration between two firms competing on the same route, while complementary alliance refers to the case in which two firms link up their existing networks and build a new network providing interlining service to their passengers.

The representative consumer has a Constant Elasticity of Substitution CES utility function of the type:

$$V_n(q_1,.....,q_n)=\left(\sum_{j=1}^{n} q_j^{\theta}\right)^{1/\theta}, \quad 0<\theta<1 \tag{1}$$

where q_j is the quantity of variety j, n the number of available varieties and θ reflects the elasticity of substitution between the different varieties.

The consumer chooses q_j so as to maximize its utility under the budget constraint:

$$\sum_{j=1}^{n} p_j q_j = I \tag{2}$$

where p_j is the price of variety j and I the consumer's budget.

The maximization gives the following demand function for a variety j

$$q_j=\left(\frac{p_j}{P}\right)^{-\sigma}\frac{I}{P} \tag{3}$$

where

$$\sigma=\frac{1}{1-\theta}$$

$$P=\left(\sum_{j=1}^{n} p_j^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$$

Let's assume that a different producer provides each variety having a constant marginal (average) cost c_j and that n is high enough that no individual producer can affect P. Producer j will set the price p_j so as to maximize its profit:

$$\max\left(p_j q_j - q_j c_{j;}\right) \tag{4}$$

This yields to the equilibrium price and quantity

$$p_j = c_j\frac{\sigma}{\sigma-1} \tag{5a}$$

$$q_j=\frac{\sigma-1}{\sigma}\left(\frac{c_j}{C}\right)^{-\sigma}\frac{I}{C} \tag{5b}$$

where

$$C=\left(\sum_{j=1}^{n} c_j^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$$

Coming back to the airline market, let's take Equations (3) and (5b) in log and use θ which have an easy interpretation:

$$\log(q_j) = -\left(\frac{1}{1-\theta}\right)\log(p_j) + \left(\frac{\theta}{1-\theta}\right)\log(P) + \log(I) \quad (6a)$$

$$\log(p_j) = \log(c_j) + \log(\frac{1}{\theta}) \quad (6b)$$

Equation (6a) shows that the number of passengers for EgyptAir will depend on the elasticity of substitution between its product and other carriers', on consumer's income, on the number of variety (*n* via *P*) and on fares. The elasticity of substitution is likely to be affected by EgyptAir performance relative to other carriers in terms of frequencies, slots, itinerary the level and quality of air and airports services delivered. Equation (6b) shows that fare set by EgyptAir will depend, in turn, on cots and on the elasticity of substitution between its product and other carriers'.

Openness of the Egyptian airline market can involve both more carriers and a higher diversity in terms of itinerary and other services which may affect *n* and θ. Hence, to examine the impact of openness on EgyptAir passengers and fares, we will add to the equations an indicator of openness. Note that while such indicator will affect p_j only directly through θ, it will affect q_j both directly through θ and indirectly through p_j and *P*. Moreover the direct and the indirect on qj go in opposite directions.

5.2 Measure of Openness

In estimating the impact of agreements in the air transport services sector on its performance, the main channel through which a given agreement affects the **variables of interest** is its impact on competition. Hence, one needs a quantitative indicator summarizing the main provisions of the agreements with respect to competition.

Given the multiplicity of dimensions and provisions of airline agreements as well as the qualitative nature of many of them, it will be very difficult to incorporate them directly into estimation. It is, therefore, necessary to construct an index that transforms the qualitative nature of the agreements' provisions into a quantitative indicator. Moreover, constructing such an indicator will be very useful for cross-countries comparison.

In constructing the Openness Index (OI), barriers can be classified according to various criteria such as by mode or *de facto* versus *de jure*. Focusing on the classification by mode, it is useful to disaggregate the sectoral trade restrictiveness/openness indexes by mode (Dihel & Shepherd, 2007). There are four modes categorizing the services' barriers, namely: Cross-border supply, Consumption abroad, Commercial presence, and Movement of natural persons (Box 2). *Cross-border supply* refers to the supply of a service from the country of the supplier into the country of the consumer. *Consumption abroad* involves the purchase of services by the consumer while abroad in the country of the supplier. *Commercial presence* entails the supplier providing services through foreign-based establishment in the country of the consumer. *Movement of natural persons* relates to the supply of services by an individual from the country of the supplier in the country of the consumer. This classification offers a clearer picture of the nature of services restrictions and permits the isolation of barriers with the highest potential impact on services trade (Marouni and Munro, 2009).

Regarding the air index, we will just deal with two modes that are relevant to the airline industry's barriers, namely: Cross-border supply, and Commercial presence. Cross-border supply (Mode 1) queries about whether Egypt has air transport agreements; the extent of its air freedom; restrictions to charter flights, low cost flights and cabotage; if it is a member of airline alliances; and how flights and gate slots are allocated in airports. Commercial presence (Mode 3) investigates the following issues: foreign ownership in the provision of international and domestic scheduled services; the public ownership in the carriers; foreign

provision of cabotage; and foreign ownership and management of airports; restrictions on the provision of repair and maintenance services through commercial presence. This classification shows the roots of the air services barriers, which need to be taken for liberalization reforms. The index is constructed so that each component could have either a 'yes or no' answer or three or more response categories. Box 3 presents the questions asked for each route in the sample. The responses are used to construct the OI per route.

6. The Results

6.1 Openness Index Results

Based on Table 2, we were able to construct seven components:

1. Working routes in a given year
2. The existence of Open Skies- Bilateral Agreements on a given route for a given year
3. Enforcement of agreements on a given route for a given year
4. Access for low cost carriers to a given route for a given year
5. Coverage of a given route for a given year by the Star alliance
6. Coverage of a given route for a given year by the COMESA
7. The existence of a code share agreement on a given route for a given year

For assigning weights to each mode, Nordas (2007) highlights three methods: an expert judgment method, a statistical method and an econometric method. The expert judgment method is subjective, though in some cases based on a highly sophisticated conceptual framework (Colecchia, 2000). The statistical method relies on factor analysis, in which one determines the contribution of each item to the total variance of the sample. The econometric method relies on gravity models aiming to explain bilateral trade by trading countries market size and bilateral trade costs (Kox & Nordas, 2006).

While the econometric method is very useful when the components are quantitative, the statistical is better when the components are qualitative as in the study. We use the Multiple Correspondences Analysis (MCA). With this approach, weights are computed in order to maximize the variance of scores within the sample of countries. Each weight is the contribution of the given component to the index variance and does not reflect a subjective judgment of the component's relative relevance or importance.[28]

The analysis suggested that 3 components (Star alliance, COMESA and Code share) are redundant in the construction of the OI. We, therefore, considered two OIs: one using the seven components, OI7, and another using only the non- redundant components, OI4. The results of the OI7 are reported in Table 3. It ranges from -2 to 2. The higher the index, the more open is the route to competition. For convenience, classes of the OI group the routes. For instance, the class of OI "-2, -1" is the least open or the most restricted. The arrows indicate whether openness has increased ↗, decreased ↘, or in status quo ⇒ on a given route.

As expected, the routes linking Cairo Airport are in the lowest range of liberalization/openness (i.e. classes (-2,-1) and (-1,0)) in 2009 due to the restrictions and constraints on access to Cairo Airport by foreign competitors. The rest of Egyptian routes; namely linking Alexandria, Assiut, Asswan, Hurghada, Luxor, and Sharm, are in the ranges of freedom (0,1) and (1,2), which is reasonable and predictable since the corresponding airports are subject to less restrictions compared to Cairo Airport. For instance, they do not have any constraint on foreign low-carrier.

[28] For a discussion, see Abdelkhalek and Ejjanaoui (2009).

All routes, except those linking Cairo Airport, are either is in a status quo or getting better in terms of openness over the period 1999-2009. This supports the measures undertaken by the Civil Aviation Authority in opening gradually the domestic market to the foreign market.

Note that although some openness components (e.g. the open skies) are implemented by EgyptAir in Cairo Airport, the latter's performance in terms of the whole OI is getting worse. This means that the restrictiveness of other components does more that compensate for the openness. Also, some of the liberalization measures that EgyptAir undertook did not have enough time to mature and show its positive implications.

6.2 Econometric Results

6.2.1 The empirical implementation of the model

As discussed above, the relevant unit of analysis in the airline market is the route level. However, deepening the analysis as such can only be done, especially when it comes to quantitative assessments, at the expense of exhaustiveness. Data availability doesn't allow us to conduct the analysis at the route level for all carriers operating on the Egyptian airline market. For this, our analysis will be limited to the main carrier EgyptAir.

The empirically testable equations are drawn from the model in Section V. The analysis there has shown that the number of passengers for EgyptAir depend on the elasticity of substitution between its product and other carriers', on consumer's income, on the number of variety and on fares. Fares set by EgyptAir depend, in turn, on costs and on the elasticity of substitution between its product and other carriers'. Openness of the Egyptian airline market having potentially an effect on these determinants, the analysis of the impact of openness on EgyptAir passengers and fares should add to these determinants, or interact them with the Openness Index.

The resulting equations are estimated over the period 1999-2009. The following adjustments to equations (6a) and (6b) have been made.

First, to take account of the potential impact of the 2007 financial crisis, a dummy variable (Crisis) is introduced.

Second, to keep the theoretical model tractable, we didn't introduce the plane capacity utilization or load factor in Section V. However, there is a consensus in the empirical literature that this variable is an important determinant of fares. The latter are decreasing in this variable. Unfortunately, there are many missing values of load factors at the route level in the series we obtained. However, Egyptair's Annual Report (2007-2008) shows that over our period of estimation the number of passengers increased faster that the available capacity bringing the load factor on European routes from 63 percent to 70 percent between 2005 and 2008. The same factor on Middle East routes increased from 64 percent to 67 percent, and on Far East routes it jumped from 57 percent to 67 percent. It decreased slightly only on African and domestic routes. Therefore, we associate the potential increase in the number of passengers with an increase in the load factor. The latter, being economically associated with a decrease in average costs, we expect the coefficients to be negative.

Third, we allow for some rigidity in fares' and passengers' equation by introducing the lag of each. Finally, preliminary estimations favor the introduction of OI as an explanatory variable rather in interaction with the other determinants. These lead to the following version of the two simultaneous equations system (6a) and (6b) which are estimated using the GMM:

$$\log(Pas)_{it} = \alpha_0 + \alpha_1 \log(GDPpc)_{it} + \alpha_2 \log(Pop)_{it} + \alpha_3 \log(Fare)_{it} + \alpha_4 (OI)_{it} + \alpha_5 (Crisis)_t + \alpha_6 \log(Pas)_{it-1} + \varepsilon_{it} \quad (7a)$$

$$\log(Fare)_{it} = \beta_0 + \beta_1 \log(Raw)_{it} + \beta_2 (OI)_{it} + \beta_3 \log(Pas)_{it} + \beta_4 (Crisis)_t \quad \beta_5 \log(Fare)_{it-1} + \eta_{it} \qquad (7b)$$

where

Pas: Number of passengers

Fare: Air Fares

Pop: Total population in the spaces linked by the route

GDPpc: Total GDP per capita in the spaces linked by the route

OI: Openness Index

Raw: Costs of Raw materials computed as explained below

Crisis: Dummy for the financial crisis. It takes 1 in 2007 and 0 otherwise

i , t: Route and year respectively.

ε , μ: Error terms

From the above discussion and Section V, the expected signs of the coefficients of interest are:

$$\alpha_1 > 0, \alpha_2 > 0, \alpha_3 < 0, \alpha_4 < 0$$

and

$$\beta_1 > 0, \beta_2 < 0, \beta_3 < 0$$

6.2.2 The data

The International Civil Aviation Organization (ICAO) provided the number of passengers for the period 1999-2009. Given its particular status as Haj destination, we removed routes linking Saudi Arabia from the estimation sample. Data on *airfares* per route come from International Airline Industry Association (IATA). They represent the average fare per seat without any information on classes; discount or other loyalty rebates. It is important to keep in mind that defined this way; the fare already includes the distance. Since they are available annually (2005-2009), the effect of seasons is not an issue.

Data on *costs* are not easily available per route. Our approach is the following. From EgyptAir annual reports costs, we obtained for the years 2005-2009:

a. The yearly total company costs split in terms of raw materials, wages and others

b. The yearly total number of kilometers covered by the company's fleet

Dividing a by b, we got the three costs per kilometers $C_{i=1,2,3}$. Then for each route we multiplied these "unit costs" by the number of kilometers, getting $D_{i=1,2,3}$. We use $D_{i=1,2,3}$ as a proxy of the costs to cover a given route which is supposed to affect the fare per route. Note that since both the fare and $D_{i=1,2,3}$ already include distance; the latter needs not enter the specification separately.

The load factor is adapted from EgyptAir annual reports. The *GDP per capita* and *population* are for the country from which a particular flight leaves or arrives (e.g. for the route Dubai-London, it is British data; for the route London-Dubai it is the British data again). These data can be drawn from the World Development Indicators (WDI). Data on *distance per route* are available from the Centre de Prospective et d'Information Internationale (CEPII, Paris).

6.2.3 Estimation Results

We estimate 6 sets of results: 3 for the passengers' equation and 3 for fares per route. Each 3 sets give: first, the OLS results using the reduced form (only exogenous variables as explanatory) of each equation; second, the 2SLS results of the system; and third, the GMM results of the system. In both the 2SLS and the GMM, exogenous variables and lagged dependent variables are used as instruments. The estimates are autocorrelation-heteroskedasticity consistent. The necessity of a simultaneous estimation of the fare and the passenger equations reduces the available sample to the period 2005-2009.

The results, using OI4 and OI7, are very similar. We will, therefore focus our interpretation using OI7 (Table 4) (see annex 6, For OI4 results). Using OLS, the overall quality of the fit is very good (the adjusted R^2 is between 0.65 and 0.82). The coefficients are all-significant (at 10 percent or higher) and exhibit the expected sign, except in the reduced form of the fare equation. The coefficients of lagged dependent variables are highly significant supporting the introduction of these variables among the explanatory. The system estimations (2SLS and GMM) exhibit similar pattern for the coefficients.

Focusing on the GMM results, regarding the passengers' equation, the variables of interest are significant with the expected sign. The 2007 financial crisis that hit the world, affected negatively the number of traveling passengers by EgyptAir airline, keeping other factors constant. Also, the coefficient of fare signifies that when fares rise by 1 percent, the number of passengers decline by about 0.3 percent, keeping other factors constant. This result is quite predictable by the law of demand. The rise in airfares makes flights more expensive for people, reducing their purchase of flights tickets and hence decreasing the number of passengers. The OI's coefficient is statistically significant at the 1 percent level. It indicates that as the aviation market becomes more liberalized, the number of passengers decreases. This is understandable in light of the higher competition that airlines will meet in such deregulated market.

Regarding the fare equation, all variables are statistically significant with the expected sign, except for the (Crisis) variable. The Raw material's coefficient is statistically significant at the 1 percent level with a positive sign. As the cost of raw materials increases by 1 percent, the fares increases by 0.1 percent, keeping other factors constant. About the coefficient of the load factor, it is statistically significant at the 1 percent significant level, and as expected with a negative sign; showing that the increase in the load factor by 1 percent reduces fares by 0.03 percent, keeping other factors constant. Also, the OI's coefficient is statistically significant at the 10 percent (nearly 5 percent) level with a negative sign. It means that as the aviation environment becomes less restricted and more liberalized, fares will decline, keeping other factors constant.

Overall, focusing on our variables of interest, the results uncover the theoretical expectation. More Openness reduces fares: the coefficient of OI7 is significantly negative in the fare equation. Openness has a direct negative impact on EgyptAir's number of passengers (coefficient of OI in the passengers equation) and an indirect positive effect (combining the coefficients of OI in the two equations) on the number of passengers The net effect will be discussed below when we simulates different scenarios.

6.3 The Impact of Further Liberalization

The previous section examines the relationship between the structure of the airline market and the number of passengers and fares to and from Egypt, taken the structure as given. In the present section, we will examine the impact of further liberalization (changing the structure) on these variables as well as on the welfare in Egypt. Welfare is composed of consumers' and firms' surpluses. Combining the impacts of output and prices, while firms' surplus is measured by profits but due to its data unavailability we use firms' revenues in general,

captures the impact on consumers' surplus. Hence our intermediate variables of interest are output, prices and profits.

For examining the impact of less restricted aviation environment on the producer, consumer and social welfare, we use the reduced form of the structural system together with the estimated parameters ($\hat{\alpha}_k and \hat{\beta}_k$) and the exogenous variables. The reduced form equations are the following:

$$\overline{Pas_{ij}} = e^{\left(\frac{1}{1-\hat{\alpha}_3\hat{\beta}_3}\right)\left(Z_{ij}^1+\hat{\alpha}_3 Z_{ij}^2\right)} \quad (8a)$$

$$\overline{Fare_{ij}} = e^{\left(\frac{1}{1-\hat{\alpha}_3\hat{\beta}_3}\right)\left(Z_{ij}^2+\hat{\beta}_3 Z_{ij}^1\right)} \quad (8b)$$

where

$$Z_{it}^1 = \hat{\alpha}_0 + \hat{\alpha}_1 \log(GDPpc)_{it} + \hat{\alpha}_2 \log(Pop)_{it} + \hat{\alpha}_4 OI_{it} + \hat{\alpha}_5 Crisis_t + \hat{\alpha}_6 \log(Pas)_{it-1}$$

$$Z_{it}^2 = \hat{\beta}_0 + \hat{\beta}_1 \log(Raw)_{it} + \hat{\beta}_2 OI_{it} + \hat{\beta}_4 Crisis_t + \hat{\beta}_5 \log(Fare)_{it-1}$$

We considered two scenarios. One where the OI7 is set on all routes at its observed minimum; i.e. OI7 = 1.38 on all routes. The other scenario assume that the OI increases by one standard deviation (which is equal to 1) on all routes; i.e. OI7 = computed OI7 + 1. The results from each scenario are compared to the fitted values with OI7 = computed OI7. In analyzing the results, one should keep in mind two features of the model. First, the calculation concerns EgyptAir's passengers not all carriers carrying passengers to and from Egypt. Hence, an increase in competition might decrease the number of EgyptAir's passengers not the number of passengers to and from Egypt. Following the theoretical model, the "lost" EgyptAir's passengers are not "lost" Egypt's passengers. Even with a constant income, the number of passengers to and from Egypt might increase if competition results in lower fares. Some of the existing passengers just switch from EgyptAir to another carrier. Provided the other carrier is Egyptian (existent or newly created), the total revenues of travel to and from Egypt should not change for the Egyptian economy. Second, the decline in the number of EgyptAir's passengers will be accompanied by a decrease in EgyptAir's total revenue. However, such decrease doesn't correspond to the decrease in EgyptAir's surplus (profits). One should deduce the accompanying decrease in expenses. To get an idea of the decrease in EgyptAir's surplus, which is the relevant variable for computing welfare, we draw on EgptAir's annual reports. These reports suggest that on average the company surplus represents 2.5 percent of total revenue. We, therefore, apply this percentage to get an estimate of the decrease in EgyptAir's surplus. Adding this decrease to a potential increase in consumer's surplus gives an estimate of the impact on welfare under a number of caveats i.e. nationality of competitors, existence of fixed/sunk costs, impact on the whole demand for travel to or from Egypt, etc.

Table 5 shows the results of the scenario where OI7 =1.38 on all routes. As a consequence of increased competition, the number of EgyptAir's passengers decrease as does the average airfare. The important question now is what would be benefits to producers and consumers ,and social welfare of having less restricted aviation market? We assume, in accordance, with the theoretical model that the decrease in fares will benefit all passengers irrespective of the carrier they choose. We can observe from Table 6 that the total revenue of producers will decrease, while the consumer surplus will increase. The net effect of producer and consumer surplus changes on social welfare is positive; the consumer surplus increase outweighs the

producers' surplus decrease. Whether working on all routes or only on MENA region, we will have the same conclusion but with smaller effect on the MENA region. This is understood from the fact that the MENA region accounts 50 percent of total passengers of EgyptAir. Similar results are found in Table 6.

The above conclusion is unpleasant to the producer (namely EgyptAir) and would disincentive them to adopt more liberalized measures even if the economy as a whole will benefit from such measures. Yet, worth mentioning, first, this result doesn't take into account that Egyptian carriers under competition pressure might improve their services and reduce their costs and end up gaining, instead of loosing, market shares. Therefore, producers' revenue might be positive in the long run, and further benefit the social welfare. Second, in such circumstances, the aviation authority should intervene and adopt the liberalization measures that prevent wasting the social welfare benefits. This might consist of twin strategies: fostering effective entry of domestic and fostering competition among domestic carriers.

7. Conclusion

In the present era of dramatic changes in the air transport services sector, this paper examines the link between the extent of liberalization and the performance of the Egyptian airline market. The study is conducted at the route level, which is the most relevant unit of analysis in this market. Sticking to the relevant unit of analysis comes, however, at the cost of limiting the study to the biggest Egyptian carrier, namely EgyptAir, because firstly EgyptAir is the main Egyptian national carrier, and secondly the other small carriers have data availability problem. A two equations system relating fares and number of passengers per route to the extent of competition and other explanatory variables is derived from a structural model of demand and supply of airline services à la Dixit-Styglitz i.e. with consumer's taste for variety. The measure of the intensity of competition is based on the construction of an Openness Index by route.

The empirical analysis uncovers the theoretical expectation. Openness reduces EgyptAir's fares but have two conflicting effects on its number of passengers. These are a direct negative impact on EgyptAir's number of passengers due to their switch to other carriers and an in direct positive effect due the reduction in fares. Simulations show that the net effect on the number of EgyptAir's passengers is negative. However, the decrease in the number of EgyptAir's passengers does not mean a decrease in the number of passengers to and from Egypt. Even with a constant income, the number of passengers to and from Egypt might increase if competition results in lower fares for all carriers. Some of the existing passengers just switch from EgyptAir to another carrier. Provided the other carrier is Egyptian (existent or newly created), the total revenues of travel to and from Egypt should not change for the Egyptian economy.

From an economic point of view, the relevant criterion for judging on the desirability of openness is the impact on welfare. Welfare is composed of consumers' and firms' surpluses. Revenues measure the impact on consumers 'surplus is, in general, captured by combining the impacts on output and prices, while revenues are a meaure of firms' surplus. Simulating two scenarios (the OI set at its observed minimum and the OI increases by one standard deviation on all routes), the results show that the consumer's surplus increases while that of producer declines; hence, leading to a net positive effect on social welfare.

Of note is that, the negative result of producers doesn't take into account that Egyptian carriers under competition pressure might improve their services and reduces their costs and end up gaining, instead of loosing, market shares. Therefore, producers' revenue might turn to be positive in the long run, and further benefiting the social welfare. Therefore, if the aviation authority wants neither to waste the benefits to social welfare nor to disincentive

Egyptian producers to liberalization measures, it should adopt the liberalization measures with twin strategies: fostering effective entry of domestic carriers and fostering competition among these carriers.

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Box 1: Definitions

First freedom	The right of an airline of one country to fly over a foreign country, without landing there.
Second freedom	The right of an airline of one country to stop in a foreign country for a technical/refueling purpose only.
Third freedom	The right of an airline of one country to carry traffic (passenger, cargo, mail) from its country to another country.
Fourth freedom	The right of an airline of one country to carry traffic (passenger, cargo, mail) from its country to another country.
Fifth freedom	The right of an airline of one country to carry traffic between two other countries providing the flight originates and terminates in its own country.
Sixth freedom	The right of an airline of one country to carry traffic between two other countries via its own country.
Seventh freedom	The right of an airline of one country to carry traffic between two other countries without the flight originating or terminating in its own country.

Source: *http://definitions.uslegal.com/s/second-freedom-of-the-air/*

Box 2: Trade Barriers by Mode

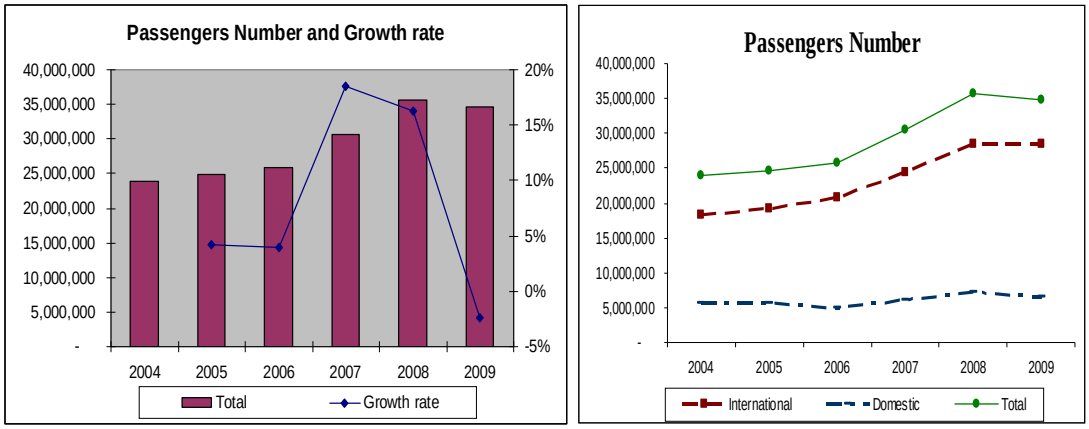
Mode 1: Cross-border supply	Refers to the supply of a service from the country of the supplier into the country of the consumer.
Mode 2: Consumption abroad	Involves the purchase of services by the consumer while abroad in the country of the supplier.
Mode 3: Commercial presence	Entails the supplier providing services through foreign-based establishment in the country of the consumer
Mode 4: Movement of natural persons	Relates to the supply of services by an individual from the country of the supplier in the country of the consumer

Source: Marouni and Munro (2009).

Box 3: Questions for the OI 's Construction

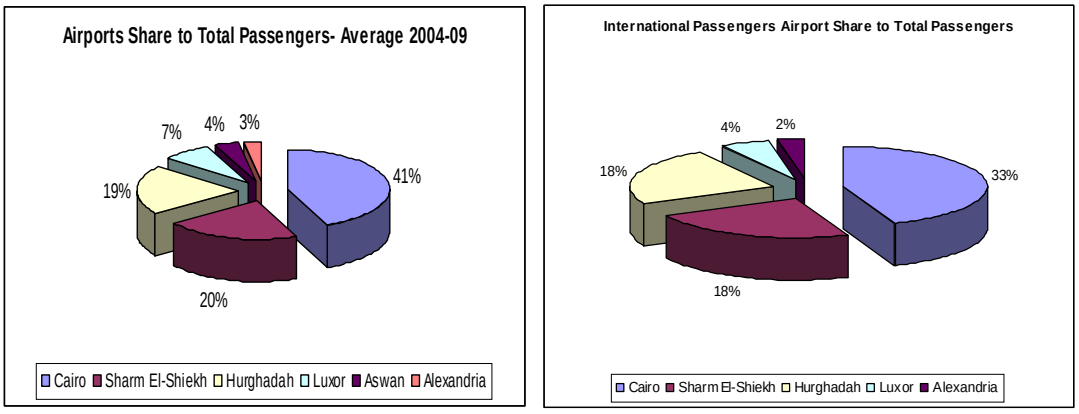
Mode 1: Cross Border Trade	***Questions***
Open Skies- Bilateral Agreements	Are domestic airlines allowed to join Open Skies agreements?
Code Share Agreements	Is the practice of multiple airlines selling space on the same flights allowed? That is, a seat can be purchased on one airline, but is actually operated by a cooperating airline under a different flight number or code.
Restriction on 5th Freedom	Is the right of an airline of one country to carry traffic between two other countries, providing the flight **originates and terminates** in its own country, allowed?
Restriction on 6th Freedom	Is the right of an airline of one country to carry traffic between two other countries **via** its own country allowed?
Restriction on foreign Low cost carriers	Are foreign **low cost** carriers permitted to operate?
Airports free for foreign movement	Is foreign movement is permitted?
Alliance Membership	Are domestic airlines allowed to join alliances? If there are many alliances, give the response for each.
Mode 3: Commercial Presence	
Foreign ownership in international scheduled service	Is foreign ownership in the provision of international scheduled services through commercial establishment, in the studied country, allowed?
Foreign ownership in domestic scheduled service	Is foreign ownership in the provision of domestic scheduled services through commercial establishment, in the studied country, allowed?
Restriction on airport ownership	Is foreign ownership is allowed for domestic airports?
Restriction on airport management	Are foreign companies allowed to manage domestic airports?

Figure 1: Number of Passengers and Growth Rate



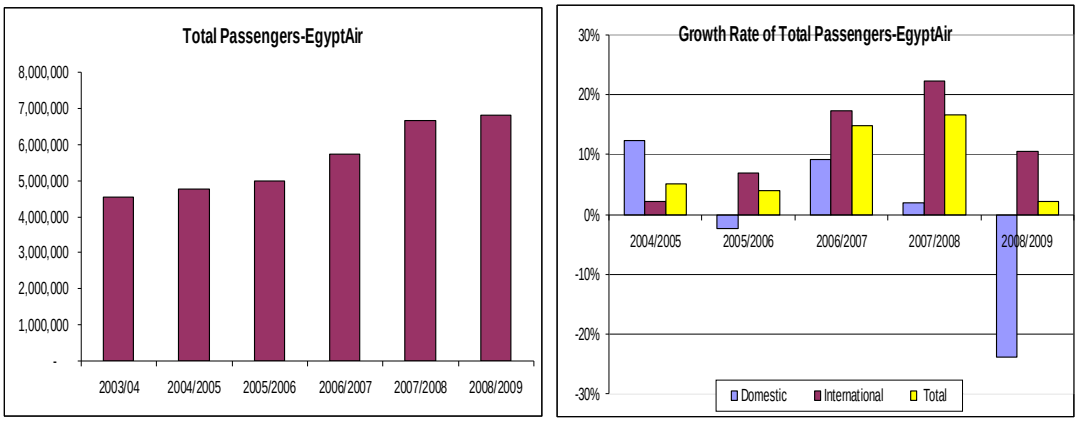
Source: Egyptian Holding Company, Time Series

Figure 2: Airport Share to Total Passengers



Source: Egyptian Holding Company for Airports and Air Navigation, Yearly Statistics for Air Traffic

Figure 3: Total Passengers (EgyptAir) and Growth Rate



Source: Egyptian Holding Company for Airports and Air Navigation, Yearly Statistics for Air Traffic

Figure 4: Passengers Growth Rate-by Region

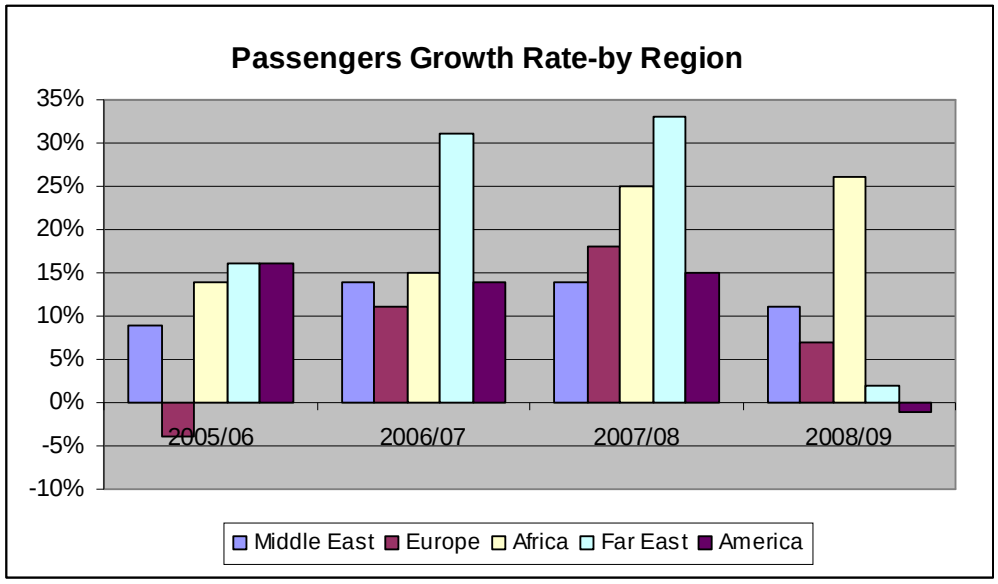


Table 1: Egyptian Airlines (2010)

Airline	Description
Air Cairo	Scheduled and Non-scheduled passenger flights
Air Memphis	Non-scheduled passenger flights
Air Sinai	Scheduled and Non-scheduled domestic passenger flights
AMC Airlines	Scheduled international and domestic passenger flights
Cairo Aviation	Non-scheduled passenger flights
EgyptAir	Scheduled and Non-scheduled international and domestic passenger flights
EgyptAir Express	Scheduled and Non-Scheduled domestic and regional passenger flights
Euro-Mediterranean	Non-scheduled international passenger flights
KoralBlue Airlines	Non-scheduled international passenger flights
Sun Air	Non-scheduled passenger flights

Source: Ministry of Civil Aviation, Egypt (2010)

Table 2: Ranking Regions by Number of Passengers Growth Rate

	2005/06	2006/07	2007/08	Average 2005/06-2007/08	2008/09
Middle East	**9%** 4th	**14%** 4th	**14%** 5th	**12%** 4th	**11%** 2nd
Europe	**-4%** 5th	**11%** 5th	**18%** 3rd	**8%** 4th	**7%** 3rd
Africa	**14%** 2nd	**15%** 2nd	**25%** 2nd	**18%** 2nd	**26%** 1st
Far East	**16%** 1st	**31%** 1st	**33%** 1st	**27%** 1st	**2%** 4th
America	**16%** 3rd	**14%** 3rd	**15%** 4th	**15%** 3rd	**-1%** 5th

Source: EgyptAir Report 2008/09

Table 3: Routes by class of OI (OI7) in 2009 and Evolution of OI 1999-2009

Routes by class of OI in 2009		Evolution 1999-2009	Routes by class of OI in 2009		Evolution 1999-2009
Class of RI: "-2, -1"					
Cairo	ABU DHABI	=	Cairo	KHARTOUM	=
	ACCRA	↘		KUWAIT	=
	ADDIS ABABA	=		LISBON	↘
	ALGIERS	=		LONDON	↘
	AMMAN	=		MADRID	↘
	AMSTERDAM	=		MOSCOW	=
	ASMARA	=		MUSCAT	=
	BAHRAIN	↘		NAIROBI	=
	BANGKOK	↘		PARIS	=
	BEIRUT	=		RIYADH	=
	BENGHAZI	↘		ROME	=
	BERLIN	=		SANA'A	=
	BRUSSELS	=		SINGAPORE	↘
	BUDAPEST	=		STOCKHOLM	↘
	DAMASCUS	=		TOKOYO	=
	DOHA	=		TUNIS	=
	KHARTOUM	=		VIENNA	↘
Class of RI: "-1, 0"					
Cairo			Cairo	INSTANBUL	↘
	ATHENS	↘		JOHANNESBURG	↘
	BARCELONA	↘		LARNACA	↗
	COPENHAGEN	↘		MONTERAL	↘
	ENTEBBE	=		MUNICH	↘
	FRANKFURT	↘		NEW YORK	↘
	GENEVA	↘		OSAKA	↘
	HARARE	↗		ZURICH	↘

Table 3: Continued

Class of RI: "0, 1"					
Alexandria	ATHENS	=	Cairo		
	BEIRUT	=		MANCHESTER	↗
	DAMMAN	↘		MILAN	=
	DUBAI	=			
	JEDDAH	=		RAS AL KHAIMAH	↗
	KUWAIT	=		SHARJAH	=
	RIYADH	=		TRIPOLI	=
Assiut	KUWAIT	↘	Hurghada	FRANKFURT	=
Cairo	ADEN	↗			
	AL AIN	=		MILAN	=
	ALEPPO	=		ROME	=
	ALFUJAIRAH	↗	Luxor	BRUSSELS	=
	CASABLANCA	=			
	DAMMAN	=		KUWAIT	=
	DUBAI	=		LONDON	=
	DUSSELDORF	=		MILAN	=
	HAMBURG	↗		PARIS	=
	JEDDAH	=		ROME	=
	KANO	=	Sharm	JEDDAH	=
	KYIV	=		MILAN	=
	LAGOS	=		ROME	=
Class of RI: "1, 2"					
Alexandria	ABU DHABI	↗	Hurghada	DUSSELDORF	↗
	AL AIN	↗			
	BAHRAIN	↗		MUNICH	↗
	BENGHAZI	=		VIENNA	↗
	DAMASCUS	↗		ZURICH	↗
	DOHA	↗	Luxor	GENEVA	↗
	MUSCAT	↗			
Asswan	PARIS	↗		ZURICH	↗
Hurghada	BERLIN	↗	Sharm	LONDON	=
	BRUSSELS	↗		ZURICH	↗

Table 4: Estimation Results of the Passengers and Fares System with OI7

	Dependent Variable: Log(Passengers)					
	OLS (Reduced form)		2SLS		GMM	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Estimate**	**t-statistic**
Constant	2.211	4.954	2.836	5.027	3.116	5.092
Log (GDP per capita)	0.044	2.336	0.047	2.449	0.049	3.592
Log(Population)	0.055	2.392	0.074	3.240	0.075	4.053
Log(Raw materials)	-0.098	-1.792				
Log (Fare)			-0.243	-3.065	-0.290	-4.029
OI	-0.117	-4.152	-0.130	-4.427	-0.127	-5.070
Crisis (dummy)	-0.668	-11.702	-0.687	-11.662	-0.677	-9.078
$Log(Passengers)_{-1}$	0.692	24.344	0.688	23.453	0.680	18.504
Number of observations	501		468		468	
Adjusted R^2	0.65		0.67		0.66	
	Dependent Variable: Log(Fares)					
	OLS (Reduced form)		**2SLS**		**GMM**	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
C	0.783	5.064	0.940	5.641	1.037	6.456
Log(Raw materials)	0.149	6.805	0.147	6.724	0.131	5.765
OI	-0.010	-1.191	-0.013	-1.657	-0.017	-1.988
Log(Passengers)	-0.004	-0.477	-0.020	-1.716	-0.034	-3.608
Crisis (dummy)	0.037	1.911	0.027	1.384	0.022	1.171
$Log(Fares)_{-1}$	0.740	24.818	0.739	24.884	0.758	20.189
Number of observations	468		468		468	
Adjusted R^2	0.82		0.82		0.81	

Table 5: Simulation Results of the Impact of Setting OI7 =1.38 on All Routes

	Impact on all passengers	**Impact on MENA passengers**
a. Actual number of passengers	2324890	724400
b. ***Simulated number of passengers***	1822460	564271
c. Difference: (b-a)	-502431	-160129
d. Actual average fare US$	280	192
e. ***Simulated average fare US$***	273	188
f. ***Difference: (e-d) US$***	-6	-4
g. ***Difference in total revenue:*** (b – a) * d + b * f US$	-151665965	-33099490
h. ***Change in consumer surplus***: - f * a US$	14311916	3008135
j. ***Change in EgyptAir surplus***: g * 2.5%	-3473589	-758074

Table 6: Simulation Results of the Impact of One Standard Deviation Improvement in the OI 7over all Routes

	Impact on all passengers	**Impact on MENA passengers**
a. Actual number of passengers	2324890	724400
b. Simulated number of passengers	2054133	640036
c. Difference: (b-a)	-270758	-84364
d. Actual average fare US$	280	192
e. Simulated average fare US$	276	190
f. Difference: (e-d) US$	-3	-2
g. Difference in total revenue: (b – a) * d + b * f US$	-82742536	-17714710
h. Change in consumer surplus: - f * a US$	7986347	1709823
j. Change in EgyptAir surplus: g * 2.5%	-1895043	-405718

Annexes

Annex 1: Private Egyptian Airline Companies Under Construction

Airline	Description
Orange Air	Non-scheduled domestic and international passenger flights
Gym Air	Non-scheduled domestic and international passenger flights
Star Air	Non-scheduled domestic and international passenger flights
Zeneath Air	Scheduled and Non-scheduled domestic and international passenger flights
Orka Air	Non-scheduled domestic and international passenger flights
Dream Bird Air	Scheduled and Non-scheduled domestic and international passenger flights
Free Bird Egypt Air Lines	Scheduled and Non-scheduled domestic and international passenger flights
Toot Air	Non-scheduled domestic and international passenger flights
Express Air	Non-scheduled domestic passenger flights
Egyptian Global Air	Scheduled and Non-scheduled domestic and international passenger flights
Nile Air	Non-scheduled domestic and international passenger fights
Faz Air	Non-scheduled domestic passenger flights
Euro Fly	Non-scheduled domestic passenger flights
Lougy Air	Non-scheduled domestic and international passenger flights
YalaGyt	Non-scheduled domestic and international passenger flights
Tulipe Air	Non-scheduled domestic and international passenger flights
Mac Air	Scheduled and Non-scheduled domestic and international passenger flights
Scorpio	Scheduled and Non-scheduled domestic and international passenger flights
Alfa Air	Non-scheduled domestic and international passenger fights
Assma Air	Non-scheduled domestic and international passenger fights
Ayoun for Tourism Development	Non-Scheduled international passenger flights
Blue Wings Air	Non-scheduled domestic and international passenger fights

Source: Ministry of Civil Aviation, Egypt (2010)

Annex 2: Market Share of Airports: Average for The Period 2004-2009

Airports	Ratio of Flights*	Ratio of Passengers**
Cairo	32%	41%
Sharm El-Shiekh	13%	20%
Hurghadah	11%	19%
Luxor	6%	7%
Aswan	3%	4%
Alexandria	4%	3%
Borg El-Arab	1%	1%
Assiut	23%	0%
Marsa Alam	1%	2%
Al-Alamein	0%	0%
Taba	1%	1%
Abu Simbel	2%	2%
Al-Areish	0%	0%
Marsa Matrooh	0%	0%
Al-Kharga	0%	0%
Port Said	3%	0%
Sharq El-Owinat	0%	0%
Al-Dakhla	0%	0%
St. Catherine	0%	0%
Al-Toor	0%	0%

Note: Al Alamin Airport started to work in 2005; *The Ratio of Flights provided by each airport to total flights provided by all airports; ** The Ratio of Passengers served by each airport to total passengers provided by all airports
Source: Egyptian Holding Company for Airports and Air Navigation, Yearly Statistics for Air Traffic

Annex 3: EgyptAir Destinations by Region in 2009

Europe	Africa	Far East	North America	Middle East
Amsterdam	Accra	Bangkok	Montreal	Abu Dhabi
Athens	Addis Ababa	Beijing	New York	Aden
Barcelona	Algiers	Guangzhou		Alain
Berlin	Asmara	Kuala Lumpur		Aleppo
Brussels	Benghazi	Mumbai		Al Hudaydah
Budapest	Casablanca	Osaka		Amman
Copenhagen	Entebbe	Seoul		Bahrain
Düsseldorf	Johannesburg	Singapore		Beirut
Frankfurt	Kano	Tokyo		Damascus
Geneva	Khartoum	Almaty		Dammam
Istanbul	Lagos			Doha
Keiv	Abuja			Dubai
Larnaca	Dar Es Salaam			Jeddah
Malta	Nairobi			Kuwait
Lisbon	Tripoli			Madinah
London	Tunis			Muscat
Madrid				Riyadh
Milan				Sanaa
Moscow				Sharjah
Munich				Ta'izz
Oslo				
Paris				
Rome				
Stockholm				
Vienna				
Zurich				

Source: EgyptAir, Annual Report 2008/09

Annex 4: Share Agreements Members

Code Share Agreements with STAR Alliance Members
Austrian Airways,
Asiana Airlines
BMI British Midland
Lufthansa
TAP
Thai Airways INT
Turkish Airlines Singapore Airlines
South African Airlines
Swiss International Airlines
United Airlines
Code Share Agreements without STAR Alliance Members
Aerosvit
Gulf Air
Korean Air
Malaysian Airlines
Olympic Airways
Syrian Airlines
Saudi Arabian Airlines
Tunis Air
Yemen Airways

Source: EgyptAir, Annual Report 2008/09

Annex 5: EgyptAir STAR Alliance Members

ANA
Singapore Airline
Lot Polish Airline
Austrian
Shanghai Airlines
Scandinavian Airlines
Spanair
Swiss International Ailrines
TAP Portugal
Lufthansa
BMI
Air New Zealand
Turkish Airlines
Asiana Airlines
Air Canada
US Airways
South African Airways
Air China
United
THAI.

Source: EgyptAir, Annual Report 2008/09

Annex 6: Estimation Results of the Passengers and Fares System with OI4

	Dependent Variable: Log (Passengers)					
	OLS (Reduced form)		2SLS		GMM	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Estimate**	**t-statistic**
Constant	2.226	4.971	2.784	4.915	3.078	5.012
Log (GDP per capita)	0.036	1.977	0.041	2.177	0.044	3.287
Log (Population)	0.050	2.174	0.072	3.158	0.074	3.976
Log (Raw materials)	-0.077	-1.438				
Log (Fare)			-0.225	-2.852	-0.274	-3.815
OI	-0.106	-3.716	-0.123	-4.073	-0.121	-4.688
Crisis (dummy)	-0.672	-11.727	-0.694	-11.746	-0.681	-9.133
Log (Passengers)$_{-1}$	0.698	24.655	0.692	23.575	0.683	18.520
Number of observations	501		468		468	
Adjusted R^2	0.65		0.66		0.66	
	Dependent Variable: Log (Fares)					
	OLS (Reduced form)		2SLS		GMM	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
C	0.786	5.120	0.942	5.692	1.033	6.425
Log (Raw materials)	0.150	6.886	0.149	6.834	0.133	5.916
OI	-0.012	-1.401	-0.015	-1.850	-0.017	-1.970
Log (Passengers)	-0.005	-0.544	-0.020	-1.773	-0.034	-3.610
Crisis (dummy)	0.036	1.865	0.026	1.336	0.022	1.174
Log (Fares) $_{-1}$	0.739	24.803	0.738	24.871	0.757	20.182
Number of observations	468		468		468	
Adjusted R^2	0.82		0.82		0.81	