COMISIÓN FEDERAL DE COMPETENCIA
MÉXICO

OCDE

A Competition Policy Assessment of the Domestic Airline Sector in Mexico and Recommendations to Improve Competition*

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April, 2010

Summary

This paper evaluates competition conditions in the domestic airline industry in Mexico, identifies impediments to competition that can be addressed by policymakers and presents recommendations. We find that the liberalization policies adopted in the mid 2000s has greatly benefited consumers. We do find, however, that policymakers can do more to improve competition in the sector. We find that saturation conditions at the Mexico City airport lead to prices on Mexico City routes that are between 40-80 percent higher compared to other routes in the country. Consumers would gain significantly if policymakers addressed the problem at the Mexico City airport. We also find that prices are approximately 30 percent lower on routes that include at least one low cost carrier. Thus, consumers would gain if policymakers removed the regulatory obstacles that entrants face in entering the market and expanding service on new routes.

* This document was prepared by the author as part of the program "Proceso para el fortalecimiento del marco regulatorio para la competitividad en México" that was initiated by the Executive Branch of the Mexican Government in January 2008 in collaboration with the Organization for Economic Co-operation and Development (OECD). The document was reviewed and critiqued by the Competition Technical Group of this program comprised of professionals from the Federal Competition Commission, the Competition Division of the OECD and independent experts. The views expressed herein do not necessarily reflect the views of the OECD, its member countries or the Federal Competition Commission.

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I. Introduction

This paper provides a competition assessment of the Mexican domestic airline industry. In it we reach conclusions about the sector's performance and the level of competition, identify impediments to competition that policymakers can address and remove, and make specific competition policy recommendations to improve competition in the sector.

The paper begins with a brief history of the airline sector in Mexico since the late 1980s. The government was the principal shareholder of the two major trunk airlines—Aeromexico and Mexicana—between the mid 1990s and the mid 2000s, fully privatizing Mexicana in 2005 and Aeromexico in 2007. On a couple of occasions during the period the Mexican Federal Competition Commission ("Competition Commission") rejected the merger application of Mexicana and Aeromexico, the most recent rejection was in 2007. Low cost carriers ("LCCs") entered the market in the mid 2000s and have had a significant impact to date, capturing about one-third of the market.

Liberalization of the sector began in the early 1990s but the process was not transparent and was under the discretion of the government. In 1995 the *Ley de Aviacion Civil* fully liberalized the sector by removing legal barriers to entry. On paper it appears as though there is free entry into the sector for Mexican nationals, and there does not appear to be onerous exit requirements. Nevertheless, entry is restricted or made difficult in several ways. First, foreign firms cannot provide domestic service and they are limited to owning 25 percent of a Mexican airline. Second, entry can be restricted if the entity that issues concessions and permits, the Secretariat of Communications and Transport ("SCT"), utilizes too much discretion—*i.e.,* if the process is not transparent, clear, and timely. Third, airlines can lose their concession if they do not provide air passenger service for 180 days. With respect to new routes, once authorized the airline must provide service on the requested route within a period of 90 days otherwise it loses the right to provide service.

The Competition Commission has analyzed competition concerns in the sector on a number of occasions and has identified several impediments to competition. These include: (i) laws and bilateral agreements that prevent foreign firms from offering cabotage service (*i.e.* domestic service) and that limit foreign ownership to 25 percent; (ii) barriers to accessing airport facilities for entrants—*e.g.,* take-off/landing slots, gates, counters; (iii) grandfather clauses favoring incumbent airlines access to airport infrastructure; (iv) obstacles and difficulties in obtaining concessions and permits from the SCT; and (v) high structural barriers such as high costs to start an airline, sunk costs of advertising and promotion, high cost of attracting consumers who may participate in the incumbents' loyalty programs—such as frequent-flyer programs—and having to compete against airlines that have interlining and codesharing agreements.

A major policy concern identified by the Competition Commission is the condition in the Mexico City Airport which since 2005 has been operating under conditions of congestion/saturation. The number of take-off and landing slots at the airport is at a maximum and cannot be increased. This limits the ability of competing carriers to enter or expand on important routes, potential competition is severely restricted. When an airport is declared to be saturated the SCT is empowered to implement market-based rules (*e.g.,* auctions) that can alleviate congestion. While these reforms could have been implemented beginning in 2006, to date no action has been

taken. In our model of airline prices in Mexico we find that flying into or out of the Mexico City airports is associated with prices that are, on average, between 40 and 80 percent higher depending on the model and holding all other factors constant, including airport charges paid by airlines for airport infrastructure. The high prices associated with flying into or out of Mexico City reflect very high entry barriers at the Mexico City airport and lack of potential competition, something which can be addressed through policy reforms, as discussed below.

According to the economic literature and an investigation of cases pursued by competition authorities in different countries, there are a number of competition policy concerns in the airline sector worldwide. The concerns include: predatory conduct; access to essential airport inputs such as take-off and landing slots; exclusionary conduct; airline marketing strategies (*e.g.* frequent flyer programs, travel-agent commissions); codesharing, alliances and mergers; and collusion. The main competition policy concerns investigated by the Mexican Competition Commission primarily include access to essential airport inputs and merger applications between the two incumbent trunk operators, Aeromexico and Mexicana.

A competition analysis of the domestic airline sector in Mexico, based upon publicly available data, leads to several conclusions about the sector's performance and level of competition. The sector has experienced fairly robust growth during the period for which data are available, 1989-2008. The compound annual growth rate for total domestic passengers (*i.e.*, trunk and regional passengers) between 1989 and 2008 was approximately 5.40 percent; for trunk passengers and regional passengers growth rates were 4.1 and 14.1 percent, respectively. During this time period Mexico's real Gdp grew at an approximate rate 3.0 percent and a simple linear regression of the natural log of real Gdp on the natural log domestic passengers results in an income elasticity of 1.06 while a simple linear regression of the natural log of real Gdp on the natural log of total (domestic and international) passengers results in an income elasticity of approximately 1.30.

There has been a significant decrease in concentration during the period 1989-2008 with strong recent gains made by three low cost carriers. In 1989 the Herfindalh Hirshman Index ("HHI")—based upon a nationwide market—was 4396 and by 2008 the figure had decreased to 1766. Five low cost carriers entered the market in 2005/2006 and by the end of 2008 the three low cost carriers that remained in the market had captured more than 30 percent of passenger traffic. With the exception of the Mexico City airport, barriers to entry and expansion are low.

The evidence on price changes is mixed. Based upon two analyzes of 12 domestic routes conducted by a Mexican think tank (aregional.com), one in 2000 and one in 2008, airline prices decreased by approximately 4 percent per year during those two time periods. Based upon the study of airline prices in this paper, however, prices on those same routes were close to 20 percent higher in 2009 compared to 2008. With respect to profitability, the available publicly-available evidence indicates low levels of profitability for the two incumbent operators since the mid 2000s. And, since 2007 four airlines have exited the market.

We collected data on approximately 500 domestic routes in Mexico in order to investigate and analyze the main determinants of airline prices and to provide policymakers with relevant information that can be used to adopt policies that remove and lower competition barriers and increase competition in the sector. The data collected included: prices, distance, number of

competitors, number of low cost competitors, prior year's number of passengers flown, income per capita of origin city, whether the destination city was a tourist attraction, a price discrimination variable, whether the airport was operating under conditions of saturation and maximum tariffs that airports can charge for use of airport facilities. We performed statistical and econometric analysis to reach our conclusions. We utilized OLS to estimate linear and non-linear relationships between price and the regressors and utilized instrumental variables (IV) estimators to account for the possible endogeneity of several regressors: existence of low cost carrier per route, number of carriers per route, and number of passengers travelled per route.

The main findings are: The existence of a low cost carrier on a route results in average prices/km that are between 26 and 35 percent lower, holding other factors constant. Flying in and out of Mexico City results in average prices/km that are between 40 to 80 percent higher, something we attribute primarily to the high entry barriers and lack of potential competition in that city due to airport congestion. When there is competition between the two incumbent carriers on a route, average prices/km are between 11 to 23 percent lower. The existence of codesharing between Mexicana and Aeromar results in prices/km that are between 30 to 38 percent higher. With respect to other important economic variables, increasing the distance traveled by one standard deviation (611 km) is associated with approximately a 6-13% decrease in price. Increasing monthly passengers by one standard deviation (10,550) is associated with approximately a 5-11% decrease in price. Income per capita has a small impact on price and is not significant at the 5% level in any the models.

Overall, these results indicate that there are potentially significant welfare gains from implementing sound competition policies in this sector—policies that remove unnecessary barriers to the entry and expansion of competitors (especially low cost carriers) and that implement market mechanisms that result in the efficient allocation of scarce take-off and landing slots. Based upon our econometric point estimates we estimate potential increases in consumer surplus from improving airport conditions in Mexico City and increasing low cost competition throughout the country. To the extent that saturation conditions are eliminated at the Mexico City airport, consumers can gain up to 3 billion US$ annually. To the extent that removing entry and expansion restrictions increases the number of low cost carriers entering unserved areas, consumers can gain up to 300 million US$ annually.

Our main policy recommendations are divided into two broad categories: (i) access to essential airport facilities, and (ii) removing policy restrictions to entry and expansion. In order to lessen the negative impact on competition due to the conditions at the Mexico City Airport, we recommend the following:

1. Implement, as soon as possible, the market-based solutions—*e.g.,* auctions for take-off/landing slots, etc—that the SCT and the Mexico City Airport have been empowered to implement since 2005 but have not done so to date;

2. Modify the pricing rules at the Mexico City Airport so that they are transparent and are set to improve economic efficiency by, for example, taking into account external congestion costs and or other factors within a price cap plan to limit monopoly pricing.

3. Eliminate “grandfather” clauses in the current regulations that favor the incumbent operators’ access to essential airport infrastructure.

4. Modify the regulations so that actual and potential entrants are represented in the Committees that administer and allocate the take-off/landing slots.

With respect to entry and expansion, we make the following recommendations:

5. Eliminate the SCT’s discretion in awarding concessions and approving new routes and schedules by guaranteeing that any safe airline can get a concession. There are several specific recommendations: (i) concessions should provide the airlines with the authority to provide service on any route, maintaining safety notification requirements on a route-by-route basis; (ii) airlines should be free to change schedules with simple notification; (iii) eliminate the rule that if the airlines does not provide service on authorized routes for 180 then they lose the right to provide the service; (iv) eliminate rule that if the airline does not begin offering service 90 days after receiving approval it loses the right.

6. Increase the limit on foreign ownership (currently at 25 percent) in order to attract additional capital and expertise. Carriers in other countries would likely find the Mexican domestic airline market attractive and increasing the limit could result in additional entry or expansion.

7. Negotiate agreements with other countries to permit cabotage service. As in the previous recommendation, carriers in other countries would likely find the Mexican domestic airline market attractive and permitting cabotage service would result in additional entry and benefit Mexican consumers.

The report is outlined as follows. Section II of the report provides a brief history of the airline sector in Mexico since the late 1980s and identifies the major events in the sector. Section III presents a discussion on the economics of airlines and the important competition policy issues that have arisen in a number of countries. Section IV of the report identifies the key institutional arrangements in Mexico—*i.e.,* legal, regulatory and policy—and policy impediments to competition in Mexico. In Section V we present economic data on the airline sector in Mexico—*e.g.* output trends, changes in the number of competitors, market shares and concentration, prices, and profits—in order to assess the sector’s competitiveness and its performance. In Section VI we present the results from our statistical and econometric analysis based upon a study of approximately 500 domestic routes. The analysis identifies the main determinants of airline prices, including the importance of policy-related variables. Finally, in Section VII we present our policy recommendations.

II. History of the Airline Sector in Mexico

The airline sector in Mexico has had a long history of government involvement and participation. The two principal airlines in Mexico are Aeromexico and Mexicana. Although these airlines

started out as private enterprises (Mexicana in 1921 and Aeromexico in 1934) by the early 1980s the government owned majority shares in both. At the time that the companies were privatized in the late 1980s they served approximately 90 percent of the market. Entry into the sector was regulated by the government through the issuing of concessions and permits to provide air service. That process, however, was neither transparent nor predictable and obtaining a concession to enter and compete against the two incumbent carriers was not easy. In August 1991 the government eased its restrictions on entry which led to the creation of new airlines that competed against Aeromexico and Mexicana.[1]

By 1994 Aeromexico and Mexicana were in difficult financial conditions, in part due to increased competition, and in that year the Federal Government permitted Aeromexico to purchase Mexicana. Losses continued to mount, however, and in 1995 the major shareholders in the company—primarily Mexican banks—created the *Corporacion Internacional de Aviacion* ("Cintra") in order to own the financial assets of the corporations and provide the airlines the opportunity to restructure financially and avoid bankruptcy. The newly-created Competition Commission approved the creation of Cintra with certain conditions particularly that it be temporary and with the goal of eventually having the airlines be sold as independent operations—something which did not occur until 2005. The financial crisis affecting Mexico in 1995, however, eventually forced the government to take control of 66% of Cintra, the rest of the equity being owned by the banks and the public. Thus, the Mexican government again became the principal shareholder of Mexicana and Aeromexico, a situation that would last more than ten years until the privatization of Mexicana in 2005 and Aeromexico in 2007. During this period competition between Aeromexico and Mexicana was not very intense, even though the Competition Commission, in approving the creation of Cintra, imposed certain requirements that were intended to maintain independent managerial and operating structures and limit the firms' exercise of market power.[2]

On different occasions between 1995 and 2005 Cintra petitioned the Competition Commission to reconsider its initial decision of having Aeromexico and Mexicana sold off into separate, independent companies. Often the justifications for such requests were the belief that the market in Mexico could only support one trunk/hub-and-spoke carrier and the desire to have a "national champion" in airlines similar to flagship carriers in other countries. The Competition Commission did not alter its decision on the matter, in part because the entrants in the early 1990s were not as successful as they were initially and did not capture significant market share.[3] By 1999, Aeromexico and Mexicana still served approximately 80 percent of the market, a decrease of just

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[1] Comision Federal de Competencia, "Caso Cintra," available at http://www.cfc.gob.mx/images/stories/comunicacion/Publicaciones/DOCUMENTO%20CASO%20CINTRA.pdf, (*Cintra Case*).

[2] Some of the requirements of the Commission were more regulatory in nature, while others were more geared toward improving competition. With respect to the former, tariffs were to be related to price-cost margins and to be benchmarked to similar carriers in other countries. With respect to the latter, administrative impediments to entering the markets were removed and the Commission monitored certain practices that could raise competitive concerns, such as travel agent commissions and codesharing.

[3] See footnote 1. See also Comision Federal de Competencia decision in 2007 on a proposed purchase of Aeromexico by Mexicana, CNT-101-207 (*Mexicana-Aeromexico*). We discuss in more detail below the analysis undertaken by the Competition Commission.

10 percentage points in about ten years. As a result, in 2005 Cintra sold Mexicana (and its subsidiary Click Mexicana) to the Mexican hotel chain Grupo Posadas for USD$165.5 million. In 2007, the Consorcio Aeromexico, S.A. de C.V., was created to replace Cintra. In October 2007, Consorcio Aeromexico, S.A. de C.V. (Aeromexico, Aeromexico Connect, 50% of Aeromexpress, Seat and Alas de América), was acquired by a group of 15 Mexican investors headed by José Luis Barraza, together with Grupo Banamex, that won the bid.[4]

By the time Mexicana and Aeromexico were privatized, the industry experienced an important development, the entry of the low cost carriers, which has had a significant impact on the sector. Carriers such as Interjet, Vivaaerobus and Volaris entered the market in 2004/2005 and have established themselves as important competitors. Other carriers following the low cost carrier option—such as Alma and Avolar—also entered the market but have since exited. By 2008 low cost carriers captured approximately one-third of the market as measured by passengers.

In terms of the institutional environment, in 1995 Mexico passed the *Ley de Aviacion Civil* and the *Ley de Aeropuertos*. The *Ley de Aviacion Civil* made more explicit and transparent the rules regarding liberalization and entry into the sector. The *Ley de Aeropuertos* began the process of privatizing many of the country's airports. Rules and regulations were passed by the SCT in subsequent years in order to implement the *Ley de Aviacion Civil* and the *Ley de Aeropuertos*. These laws are discussed in greater detail in Section IV.

III. Airline Economics and Competition Policy issues

In this section of the paper, we highlight the important economic characteristics of the airline industry and the competition policy concerns that have been highlighted in the literature and considered by regulators throughout the world. The economic and competition issues discussed in this section are relevant for Mexico.

III.1 Economic Characteristics of the Sector

A major cost characteristic of airlines is the existence of strong economies of density.[5] The search for economies of density is an important reason for the proliferation of the hub-and-spoke arrangement post market liberalization and helps explain many of the strategic decisions that airlines make—*e.g.,* code-sharing, alliances, mergers.[6] A hub-and-spoke system brings passengers from origin cities (spokes) to intermediary points (hubs) to destination cities (spokes) and the economic benefits of the system are well documented in the literature.[7] On the demand side, the economic literature finds air travel to be price elastic—consumers are expected to

[4] The sale of Aeromexico to the group of 15 Mexican investors came about after Mexicana's offer to buy Aeromexico was rejected by the CFC, see *Mexicana-Aeromexico*.

[5] Economies of density are the variation in unit costs caused by increasing transportation services *within a network of a given size*. Economies of density are distinct from economies of scale, the latter being the variation in unit costs caused with respect to proportional changes *in both network size and the provision of transportation service*. Caves et. al. (1984) find an elasticity of marginal cost with respect to traffic of -0.20 while Brueckner and Spiller (1994) find it to be between -0.40 and -0.35.

[6] See Caves *et. al.*(1984) for a discussion of economies of density and scale in the U.S. airline industry.

[7] See Caves *et. al.* (1984), Brueckner and Spiller (1994) and Brueckner *et. al*. (1992).

change their consumption of air travel proportionally more than changes in price—while income elasticity estimates are closer to unity.[8]

Not all airlines choose a hub-and-spoke network as demonstrated by the success of the LCC model. In the U.S., the existence of an LCC on a route was found to be a significant variable affecting fares, even more important than the number of competitors.[9] LCCs generally, although not exclusively, provide point-to-point, non-stop connections rather than a hub-and-spoke arrangement. As discussed by Gillen (2006), while the LLC also creates a network structure that promotes connectivity it trades off lower levels of service, as measured in capacity, frequency, and product characteristics, against lower fares. All these factors result in lower costs for LCCs.[10]

With respect to relevant markets, much of the economic literature treats point of origin, point of destination ("O&D" or "city pairs") as separate economic markets.[11] This makes intuitive sense. Airline travel between Mexico City and Monterrey is a different service than airline travel between Mexico City and Cancun. The analysis on relevant markets in airlines normally centers around type of air passenger service (*e.g.*, regularly scheduled vs. charter service, non-stop vs. connecting service), type of passenger (*e.g.*, time sensitive vs. time insensitive) and whether some type of intermodal service such as bus and rail are substitutes for certain routes.[12]

There is considerable debate surrounding the extent of barriers to entry and there has been considerable debate surrounding the level of sunk costs and, therefore, whether airline markets are considered contestable.[13] A strong belief in contestability would lead one to not be overly concerned by relatively few (or even one) carriers operating city pairs, as potential competition limits monopoly pricing. On the other hand, a strong scepticism of contestability would lead one to be concerned over few (or one) carrier operating city pairs and the ability of potential competition to constrain prices.

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[8] See, *e.g.,* Brueckner and Spiller (1994) who find own price elasticity of demand for air travel between -2.50 and -2.25 with an income elasticity of demand near 0.6. Oum and Young (1992) find demand elasticities of -1.52 and -1.15 for leisure and business travellers, respectively. Adrangi and Raffiee (2000) find demand elasticity of -1.98 and income elasticity of unity. Berry and Jia (2009) find demand elasticity of -1.67 in 2006.

[9] U.S. Department of Transportation (1999). We reach the same conclusion in our study of airline prices in Mexico as discussed in Section VI of the paper. See also Morrison (2001) who estimates the estimated savings due to actual, adjacent and potential competition from Southwest airlines to be $12.9 billion, amounting to about 20 per cent of the airline industry's 1998 domestic scheduled passenger revenue and slightly more than half the fare reductions attributed to airline deregulation.

[10] According to Gillen (2006) in the U.S. LCCs have about a 40 percent cost advantage relative to the full service carriers while in Europe Ryanair, the most successful LCC in Europe, has close to a 60 percent cost advantage.

[11] Borenstein (1989). This is also consistent with OECD (1999).

[12] Time sensitive travellers are usually business travellers that place a high premium on non-stop flights, frequency of service, and ticket flexibility to name a few. Leisure travellers place a lower value on these amenities and place a higher value on price. For most time sensitive travellers, charter service is a poor substitute for regularly scheduled service while for some leisure travellers it may be a good substitute. And time sensitive travellers may not view regularly scheduled connecting service as a good substitute for regularly scheduled non-stop service. Intermodal forms of transportation such as automobiles, buses and trains are usually not considered good substitutes for airline service unless the route distance is relatively short and the prices are similar.

[13] See, *e.g.,* Swchartz (1986) who states that evidence from the airline industry points to non-contestability and Morrison and Winston (1987) who find that both actual and potential competition are significant factors in explaining welfare in the industry. See also Borenstein (1992) for a review of the literature.

Airline city pairs often are cited as examples of contestable markets—see Bailey and Baumol (1984)—because of the belief that they are thought to have little sunk costs. The cost of airlines, while significant, is not sunk because they are mobile and can be transferred to other markets and there is an active secondary/resale market.[14] In addition, airport plant such as control towers, runways and terminals are borne not by the carrier but the airport. The sunk costs that exist include intangibles such as start-up losses, local advertising, and transaction costs involved in organizing operations, obtaining gates and slots, and soliciting patronage.

Butler and Huston (1989), however, examine the nature of airline entry costs and find that the sunk cost of entering on a very large level, such as establishing a hub, are far too large for a prospective entrant to ignore and that they surely constitute a significant disincentive to entry at that scale. The hub-and-spoke arrangement has become the dominant supply arrangement used by many airlines but if the sunk costs of establishing a hub are significant, there are limits to the number of hub-and-spoke carriers that can exist and limits to the ability of potential competitors to constrain hub-and-spoke carriers' fares. This helps explain, in part, the success of the LCCs because they do not generally employ a hub-and-spoke system and thus do not incur the large sunk costs to replicate hub-and-spoke system.

Examples of possible entry barriers and possible sunk costs for European airlines are contained in Domanico (2007). These include: discriminatory access to airport slots for entrants (who must compete for slots with incumbent who have *grandfather's rights*), the hub-and-spoke arrangement (costly for entrants to replicate), and State aid and bilateral agreements (favouring incumbent/national carriers). Other examples cited by Domanico include frequent flyer programs, code sharing agreements, and mergers, alliances and franchising agreements.

III.2 Competition Concerns in the Airline Sector

An examination of the economic literature and a review of some competition authorities' cases and investigations identify a number of competition concerns in the airline industry. In this section I summarize the major competition concerns in the sector.

According to the OECD (1999), domestic deregulation has removed legal barriers to entry and exit and control of fares and services in most of the OECD countries, including Mexico.[15] Thus, other than the concerns surrounding the transparency in obtaining concessions and permits in Mexico, further discussed below, legal and regulatory barriers to entry and expansion are not an issue.

Predatory conduct on the part of airlines has been a major competition concern investigated by competition authorities around the world. The concern is generally the following: an LCC begins to offer service on routes served by incumbent airlines and the incumbent carrier responds by reducing fares on the routes or increasing capacity to such an extent that the LCC does not capture sufficient traffic to be profitable and is forced to withdraw service. The incumbent carrier

[14] The fact that airlines are mobile and can be transferred to other markets in response to price increases led Alfred Kahn to describe airlines as "marginal costs with wings".

[15] The same cannot be said, however, for international service, which is governed by a web of bilateral agreements that can significantly restrict entry and the level of services provided. A few countries have negotiated "open skies" agreement which do not restrict entry or services. Even these agreements, however, do not typically permit entry from foreign (third country) airlines or cabotage. We do not analyze international air passenger service to or from Mexico.

thus responds by raising fares dramatically to recoup the losses associated with its predatory conduct. Alternatively, an LCC begins to offer service on routes not served by incumbent airlines which then causes incumbent airlines to flood the route with cheap service. There have been major cases prosecuted throughout the world including in the United States, Canada and Europe with different outcomes.[16] The Competition Commission in Mexico has not investigated the issue and we have not come across evidence whether such practices have or have not taken place in Mexico.

Access to airport take-off and landing slots is an essential input into the provision of airline flights. If carriers do not have adequate access to these slots they are unable to provide competing airline services. In many airports, Mexico City included, there is insufficient airport capacity to meet the level of service demanded by airlines, especially new LCCs. In some cases, incumbent airlines are given preferential treatment, such as grandfathered clauses, in accessing slots which can distort the competitive process. In more extreme cases, there is substantial cross-ownership among airlines and airports which can provide the airline with more favourable access to airport slots. The OECD (1997) discusses best policies with respect to improving competition and the efficient provision of airport services, these include: removing restrictions on inter-airport competition, removal of regulatory control where competition is effective, allocation of slots using market mechanisms, (*e.g.,* auctions), and dealing with the hoarding problem by using competition law. As discussed above in its *Airport Opinion*, the Competition Commission discussed the competition problems caused by the conditions in the Mexico City Airport and potential remedies and in this analysis we quantify the costs to Mexican consumers from such conditions.

Exclusionary conduct is conduct by an incumbent firm to keep potential rivals from entering its markets or to keep existing rivals from expanding in one or more markets. For example, the incumbent firm may take control, on a pre-emptive basis, of essential inputs, services, or facilities required by a rival firm to compete with the incumbent, raising a rival's costs of providing a good or service, or contracting with customers so as to preclude them from becoming customers of a rival firm. With respect to airlines, exclusionary conduct can apply when a dominant carrier obtains access to and control of certain airport facilities or services (*e.g.*, gate space, counter space, baggage handling facilities) before a competing carrier has an opportunity to enter into or expand in the market. Exclusionary conduct can also apply to the pre-emption of takeoff and landing slots. A dominant carrier's pre-emption of slots would entail acquiring control of slots that it had no immediate use for, but that it wished to hold in order to keep entrants out of the market. If the carrier had to use the slots in order to maintain control of them, it might be able to schedule some service in the slots just to occupy them (even if the service operates at a loss).[17] The

[16] The U.S. Department of Justice filed suit against American Airlines on May 13, 1999 alleging that American had engaged in predatory and monopolistic conduct in violation of Section 2 of the *Sherman Act*. The case was ultimately dismissed in 2001. In 2002, the German Federal Cartel Office brought a case against Deutsche Lufthansa for its pricing on a route by competitor Germania alleging violation of abuse of dominant position which required Lufthansa to price above its competitor's level for a period of two years. In 2001 the Canadian Competition Commission filed a case against Air Canada for operating and increasing capacity on a number of eastern Canada routes at fares that did not cover avoidable cost.

[17] According to the Canadian Competition Bureau, this is referred to as "pre-emptive" scheduling and involves the expansion of capacity in the market at a time before it can generate at least a competitive rate of return on a flow basis. In the absence of potential entry by a new carrier into the market, the incumbent carrier would have no incentive to expand capacity prematurely because its overall profits would be higher by delaying the increase in service until

Competition Commission in Mexico has not investigated the issue and in this analysis we have not come across evidence whether such practices have or have not taken place in Mexico.

Airline marketing strategies that have attracted the attention of competition authorities are: (1) the use of loyalty marketing programs, such as frequent flyer programs, (2) the use of travel agent commission overrides, and (3) corporate discount programs. While frequent flyer programs are common in the airline industry and help provide a loyal base of customers under certain conditions the program can be used anticompetitively. For example, as part of a campaign to eliminate a new rival, the dominant airline may increase the frequent flyer awards on the route beyond what it would normally offer on similar routes on which it faces competition. The same can apply to travel agent commissions in the sense that the travel agent would be given higher commissions if it booked more customers with the dominant airline on the route facing competition. The Competition Commission in Mexico has not investigated the issue and in this analysis we have not come across evidence whether such practices have or have not taken place in Mexico.

The economics of airlines are such that the hub and spoke carriers have strong incentives to grow their network to lower costs and offer consumers more destinations, greater frequency of flights, more amenities. Alliances, code sharing, and ultimately, mergers are means to achieve network growth. There can be, however, significant competition concerns with these strategies especially when the partners compete on nonstop routes between gateway cities. Airline alliances are granted antitrust immunity so that they can cooperate on pricing and that cooperation can, in theory, spill over into discussing pricing on routes that the airlines compete with one another as opposed to the routes where both airlines provide a leg of the journey and where price cooperation may be beneficial.[18]

With respect to airline mergers, the economic effect of airline mergers and alliances depends upon the nature of the merging networks. An alliance or merger between two non-overlapping networks has fewer anti-competitive effects. As discussed by OECD (1999), a merger of two networks, which do not overlap, has the potential for enhancing efficiency (by enhancing the scope of “seamless” service) at the risk of reducing the number of potential entrants into the network’s markets. There is less competitive concern in the case of international alliances because regulatory restrictions prevent competitive entry by a foreign airline into a domestic market. On the other hand, a merger or alliance of two overlapping networks has significantly greater potential for anticompetitive effect, especially on overlapping non-stop (hub-hub) routes

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market growth justified it. It is the threat of new entry that drives the incumbent to expand its capacity, and the capacity expansion acts as an entry barrier. In the presence of a “use it or lose it” slot allocation policy, the Canadian Competition Bureau determines whether a dominant carrier has preempted take-off and landing slots on the basis of whether the carrier is covering the avoidable cost of offering the service in the slots for which pre-emption is alleged.

[18] See Lee (2006) for a number of empirical articles that investigate the impact of alliances and code sharing on prices and output. Recently, the European Union launched investigations into the Star and Oneworld airline alliances on concerns that their agreements on transatlantic routes may breach EU rules, see http://www.euractiv.com/en/transport/eu-probes-transatlantic-airline-alliances/article-181424. In the article a Commission spoken is quoted as saying the EU generally has no issue with alliances *per se*. In this case the level of cooperation under the agreements seem to be more involved than in previous alliances as the parties intend to jointly manage schedules, capacity, pricing and revenue management on transatlantic routes, as well as share revenues and sell tickets on these routes.

and overlapping connecting (*i.e.*, not non-stop) routes. The Competition Commission has on several occasions rejected the merger between the two incumbent carriers in Mexico.

Lastly, collusion can be a problem in the airline industry as demonstrated by the fact that airlines have pleaded guilty to conspiring to fix prices in different airline markets and countries and as demonstrated by the criminal penalties that have been assessed on airline executives.[19] The economics literature identifies characteristics that make industries prone to collusion. In general, there is a strong incentive for firms to deviate from any collusive arrangement. Two general requirements for collusion are that firms are able to detect in a timely way that a deviation has occurred and there must be punishment of the deviation or the credible threat of punishment. Some of the structural factors that make collusion more likely are: high concentration, high entry barriers, strong cross-ownership and other links among competitors, weak buyer power, mature stable markets, product homogeneity, and symmetry in terms of size/market share, costs, technological knowledge and capacities.[20] The Competition Commission in Mexico has not opened investigations on possible collusion in the sector and we have not come across evidence whether such practices have or have not taken place in Mexico.

IV. Institutional, Regulatory & Legal Environment in Mexico

In this section of the paper, we discuss the key institutional features of the Mexican airline sector in order to identify policy impediments to competition. The two principal laws currently governing the airline sector are the *Ley de Aviacion Civil* and the *Ley de Aeropuertos*. We discuss the relevant features of both of these laws as well as regulations that implemented the laws. In addition, the Competition Commission has studied the airline industry on a number of occasions, primarily as it involved merger applications between Aeromexico and Mexicana but also through its analysis of airport competition, and we review the main impediments to competition identified by the Competition Commission.

IV.1 Legal & Regulatory Environment

In 1995 Mexico enacted the Aviation Law (*Ley de Aviacion Civil*) and in 1998 the SCT issued rules implementing that law.[21] The purpose of the law and regulations was to make more explicit and transparent the rules regarding the liberalization process that was already occurring in the

[19] See, e.g., USDOJ, "Major International Airlines Agree To Plead Guilty And Pay Criminal Fines Totaling More Than $500 Million For Fixing Prices On Air Cargo Rates," (June 26, 2008), http://www.usdoj.gov/atr/public/press_releases/2008/234435.htm; EU, "Antitrust: Commission confirms sending Statement of Objections to alleged participants in a air freight cartel," (Dec 22 2007) MEMO/07/622; (international/Korea), 2000-2006 e.g., U.S. v. Asiana Airlines, Inc., Crim. No.: 1:09-cr-00099-JDB (filed April 9, 2009) (Count Two); USDOJ, "Three International Airline Companies Agree To Plead Guilty To Price Fixing On Air Cargo Shipments," (April 9, 2009), http://www.usdoj.gov/atr/public/press_releases/2009/244630.htm; European Commission, "Commission fines SAS and Maersk Air for market-sharing agreement" (July 18, 2001), IP/01/1009

http://europa.eu/rapid/pressReleasesAction.do?reference=IP/01/1009&format=HTML&aged=0&language=EN&guiLanguage=en

[20] See Motta (2004) pp 142-147.

[21] See *Ley de Aviacion Civil* available at: http://www.sct.gob.mx/uploads/media/Ley_de_Aviacion_Civil.pdf and implementing rules by the SCT available at: http://www.sct.gob.mx/uploads/media/Reglamento_de_la_Ley_Aviacion_Civil.pdf.

airlines sector. In order to provide air passenger services in Mexico a concession and a permit is required and the SCT was given the authority to grant concessions and permits to airlines. Concessions and permits for domestic airline service can only be granted to Mexican nationals, thus foreign carriers are prohibited from providing domestic (cabotage) service in Mexico.[22] And, foreign carriers are restricted to owning at most 25 percent of a Mexican airline. Concessions are given for a period of up to 30 years and can be renewed as long as certain conditions have been met. Concessions can be revoked for a number of reasons.[23] Carriers are able to set tariffs freely although they must be registered with the SCT which is empowered to set minimum or maximum prices if it believes that the tariffs are predatory or reflect monopoly power.[24]

On paper, it appears as though there is free entry into the sector for Mexican nationals, and there does not appear to be onerous exit requirements. In fact, in its rules implementing the *Ley de Aviacion Civil* (Article 24 A), the SCT states that it cannot reject a request for a concession or for serving a new route even though it may believe that the market demand is being sufficiently met. Nevertheless, there are several competition concerns. First, as in many other countries foreign firms cannot provide domestic service and they are limited to owning 25 percent of a Mexican airline.[25] Second, a competition concern can occur if the SCT utilizes too much discretion—*i.e.,* if the process is not transparent, clear, and timely—in granting concessions or in approving new routes. The latter is of particular concern because the concession includes the specific routes that the airline is authorized to provide. If an airline wants to provide additional routes—or if it wants to add more flights to existing routes—it must request and be granted permission from the SCT. This can be an impediment to competition if the process takes too long to meet rapidly changing demand and supply conditions. Third, airlines can lose their concession if they do not provide air passenger service for 180 days. With respect to new routes, once authorized, the airline must provide service on the requested route within a period of 90 days otherwise it loses the right to provide service on the route. This can be a competition concern because it seems to unnecessarily reduce flexibility for airlines as there can be legitimate business reasons for not serving routes for extended periods of time—*e.g.* seasonality and/or demand/supply shocks.

In 1995 Mexico also enacted the Airport Law (*Ley de Aeropuertos*) and in 2000 the SCT issued rules implementing that law.[26] The purpose of the law and regulations was to regulate the construction, administration, and operation of airports in Mexico. For our purposes, the relevant sections are those that discuss the regulation of take-off and landing slots and those that determine and implement rules to alleviate saturation conditions at airports.

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[22] Cabottage refers to a third party (foreign carrier) providing national air service. For example, a British Airline flight from London to Mexico City that then flies passengers from Mexico City to Monterrey would be an example of cabbotage. It is, in effect, foreign competition. This type of competition is restricted by many countries, not just Mexico.

[23] Including, for example, violating and not conforming to security and safety regulations, flying routes not authorized and contained in the concession contract, not providing air passenger service for 180 days, charging prices that are different than the prices registered, lapses in insurance, etc.

[24] The SCT is first required to obtain an opinion from the Competition Commission that there exist insufficient competition on a route prior to being able to set prices.

[25] The 25% restriction on foreign ownership is contained in the *Ley de Inversion Extranjera*.

[26] See, http://www.sct.gob.mx/uploads/media/Ley_de_Aeropuertos.pdf and http://www.sct.gob.mx/uploads/media/Reglamento_de_la_Ley_de_Aeropuertos.pdf (*Airport Regulations*).

The airports determine the assignment of take-off and landing slots based upon the recommendations of a Committee that takes into account several factors.[27] Once an airline obtains a slot it can trade it or transfer it to another airline. There are two competition concerns with the manner in which slots are assigned to carriers. First, the Committee that is in charge of assigning the available slots to airlines usually comprises members of incumbent carriers but in some airports may not include members of competitor airlines or potential competitors. Potential entrants are at a disadvantage because only airlines that are operating in the airport are represented in the Committee. This can be particularly problematic at saturated airports where entry by new competitors may not be possible. Second, incumbent carriers are given preference (through grandfather clauses) when assigning slots. For example, the regulations state that a slot is automatically given to the airline that used it in the "last period."

With respect to rules dealing with airport saturation, the SCT is empowered to determine that an airport is saturated with respect to take-off and landing slots. Once this happens, the airport can implement a number of reforms. During the first four years after a declaration of saturation, the airport is empowered to take back slots from airlines, those slots in which in the previous year were not utilized more than 85 percent of the time. The slots can then be auctioned. If three years after the auction saturation conditions still exist the airport is empowered to take back 10% of slots that all airlines are using during the peak hours. These slots will also be auctioned to the highest bidder.

IV.2 Federal Competition Commission Decisions

The Competition Commission has investigated the airline sector on a number of occasions and in this section we summarize its main findings as it pertains to barriers to entry and expansion in the sector. While the Competition Commission's analysis and investigation has involved different aspects of the airline sector in Mexico, a good amount of its work has been devoted to merger applications between Aeromexico and Mexicana. Several decisions are worth highlighting—the *Cintra* case beginning in 1995 and the 2007 *Mexicana-Aeromexico* decision. In addition, in 2007 the Competition Commission published an Opinion on how to improve competition for airport services, some of which is relevant to our investigation.

In the *Cintra* case in 2000, the Competition Commission had to decide whether Aeromexico and Mexicana should be privatized as one individual company or as two separate, independent companies that would compete against each other. In its analysis the Competition Commission identified a number of barriers that limited entry and expansion in the sector. These included:

1. The *Ley de Aviacion Civil* and bilateral agreements between Mexico and other countries prevent foreign firms from offering cabotage service in Mexico;

2. The *Ley de Inversion Extranjera* limits foreign participation in Mexican airlines to 25%, which prevents a foreign carrier from obtaining control of a Mexican airline;

3. Barriers to airport facilities for entrants—such as take-off/landing slots, gates, counters, etc—and "grandfathered" clauses favouring the incumbent airlines

[27] See *Airport Regulations* Articulo 95.

access to airport infrastructure. This is especially a problem in the Mexico City airport which is the most important origin-destination city in Mexico;

4. Obstacles and difficulties in obtaining concessions from the SCT, permits for expanding into different routes, and permission to increase flight frequencies;

5. High exit barriers imposed by the previous political administration;

6. Structural barriers such as high costs to start an airline, sunk costs of advertising and promotion, high cost of attracting consumers who may participate in the incumbents' loyalty programs, such as frequent-flyer, and having to compete against airlines that have interlining and codesharing agreements.[28]

Their investigation of the sector at that time led them to conclude that the market was still highly concentrated and it was highly probable that a merger between Aeromexico and Mexicana would permit the merged company to unilaterally set prices or restrict output.[29]

In 2007 the Competition Commission considered and rejected the purchase of Aeromexico by Mexicana, which had been privatized and sold off from Cintra in 2005.[30] The Competition Commission acknowledged the significant changes that had occurred in the sector since the last review—primarily the entrance of low cost carrier since 2004—nevertheless, according to them the changes were insufficient to prevent the exercise of market power by the merged firms. In its decision, the Competition Commission identified the same barriers as in the *Cintra* case. It did, however, emphasize the increased importance of barriers to airport facilities because in 2005 the SCT had declared the airport in Mexico City to be saturated, meaning that the number of take-off and landing during peak house was at full capacity making it difficult for entrants to compete effectively in the very important Mexico City market. Lack of access to airport facilities was seen as a major impediment to competition and growth in the sector. The Competition Commission stated:

> The assignment of take-off and landing slots is an important barrier to the entry of new competitors given that the airport facilities are limited and those airlines that have ample slots within an airport that is saturated have a competitive advantage that converts itself into a barrier to entry for new competitors.[31]

In the same report the Competition Commission summarized the conditions in the Mexico City Airport. Aeromexico and Mexicana combined had approximately 60 percent of the take-off and landing slots in Mexico City, 40 percent in Monterrey and close to 50 percent in Guadalajara. The Mexico City Airport is particularly important because 66 percent of passengers have it as either the origin or destination airport. In 2005 the Mexico City Airport reached saturation conditions because it reached the limit of 54 operations per hour. The Competition Commission concluded:

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[28] *Cintra Case* p. 16.

[29] *Id*. p. 15.

[30] See *Mexicana-Aeromexico* decision, footnote 3.

[31] *Id*. p. 5.

> In an airport that is operating under saturation conditions the lack of take-off and landing slots becomes a competition problem given that since there are no slots for new competitors it becomes a barrier to entry.[32]

In the same year as the *Mexican-Aeromexico* decision, the Competition Commission released an opinion on how to improve competition at the country's airports and some of the discussion in the decision is relevant for our study.[33] As discussed above, the country's airports were privatized in the mid 1990s and three independent private groups currently own many of the major airports. The airport of Mexico City, however, is not majority privately-owned but rather owned by the state. In its *Airport Opinion*, the Competition Commission reiterated the importance of the Mexico City Airport to new entrants and the negative impact on competition that is occurring because of the saturation conditions. In addition they also pointed to the pricing methodology used to set prices at the Mexico City Airport—*i.e.*, landing and take-off slots—as a problem that could have competition implications. Because the Mexico City Airport is not a private entity it is not subject to the pricing methodology used by private airports as required by the *Ley de Aeropuertos*. Instead, its tariffs have to be approved by the Secretaria de Hacienda y Credito Publico (*i.e.,* the Treasury Agency in charge of public finances and budgets) just like all other publicly-owned enterprises in Mexico. Thus, the pricing methodology used to set airport prices at the Mexico City Airport is not necessarily consistent with achieving economic efficiency or ensuring that these (essential) input prices to airlines (especially new entrants) do not become a competition barrier.

This is an important issue for competition policy because setting efficient airport prices—prices which become important input prices for airlines—can result in a better utilization of scarce resources, gains in efficiency and improvements in airline competition by reducing congestion conditions. According to an OECD report, a profit-maximizing, independent airport has strong incentives to allocate take-off and landing rights and to invest in new capacity efficiently.[34] Specifically:

> A profit-maximizing airport has strong incentives to take whatever actions are necessary to ensure that it is able to extract the maximum revenue possible from each take-off and landing. As is well-known, this involves charging according to the demand elasticity of the service for which the take-off or landing will be used. This would certainly involve charging more for the right to take-off or land at peak times. It may further involve careful price discrimination between different carriers operating different aircraft or different routes. It may also involve holding auctions to ensure that the rights are allocated to those airlines which value them most highly.[35]

Currently, this type of pricing strategy is likely not utilized at the Mexico City Airport because the objective function for setting airport tariffs is set by Hacienda, which likely pursues different objectives than economic efficiency.

With respect to the specific saturation conditions in the Mexico City airport, the *Airport Opinion* provided more detail on those conditions and on the SCT's proposals on how to reduce them, proposals that, to date, have not yet been fully implemented. The Competition Commission once

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[32] *Id*. p. 6.

[33] See, Oficio PRES-10-096-2007-182 (*Airport Opinion*).

[34] See OECD (1997) at 7.

[35] *Id*. at 7.

again confirmed that the saturation conditions at the airport were harming competition. As discussed previous, SCT rules empower the airport to take back unused slots and to auction them off to the highest bidder.

According to the Competition Commission, the rules that the SCT could implement have some pro-competitive elements such as auctioning off the slots to the highest bidder if airlines utilize them less than 85 percent of the time, thus preventing airlines from hoarding time slots to prevent entry. This also ensures that the cost of the time slots reflects the value of congestion. Nevertheless, the time frame of nine years before which 50 percent of the times slots are determined by auction clearly favors the established airlines. Moreover, no auction has yet occurred and it is not clear whether entrants can participate in the process.

V. Competition Assessment of the Mexican Airline Sector

In this section of the report we analyze data on the Mexican airline sector in order to reach conclusions about the sector's performance and level of competition. The main conclusions of this section include: strong output growth in the sector during the 1989-2008 period; significant decrease in concentration during the same period with strong recent gains made by three low cost carriers; price evidence is mixed, with some evidence showing declining prices since 2000 but other evidence pointing to a recent increase in prices; and since the mid 2000s, low levels of profitability of the two incumbent operators and since 2007 four airlines have exited the market.

V.1 Output Growth

Table 1 shows the growth in Mexican domestic airline passengers during the period 1989-2008. The data are listed separately for passengers travelling on trunk airlines, passengers travelling on regional airlines and total (trunk plus regional) passengers travelled.

Table 1
Total, Trunk and Regional Domestic Passengers, 1989-2008

Year	Total	Regional	Trunk	Year	Total	Regional	Trunk
1989	10,194	588	9,606	**1999**	18,248	2,347	15,901
1990	11,438	734	10,704	**2000**	17,762	2,362	15,400
1991	12,892	784	12,108	**2001**	17,923	2,805	15,118
1992	14,280	1,108	13,172	**2002**	17,591	2,896	14,695
1993	14,972	1,374	13,598	**2003**	18,411	3,079	15,332
1994	18,394	1,631	16,763	**2004**	19,531	2,850	16,681
1995	14,857	1,736	13,121	**2005**	19,829	2,936	16,893
1996	14,199	2,003	12,196	**2006**	22,165	3,903	18,262
1997	15,428	2,187	13,241	**2007**	27,401	5,522	21,879
1998	17,046	2,181	14,865	**2008**	27,649	7,180	20,469

Source: *La Aviacion Mexicana en Cifras*, 1989-2008, http://www.sct.gob.mx/transportes/

In 2008 approximately 28 million passengers flew on domestic flights in Mexico. The compound annual growth rate (CAGR) for total domestic passengers between 1989 and 2008 was

approximately 5.40 percent. The CAGR for trunk passengers was 4.1 percent while for regional passengers it was 14.1 percent. Much of the growth in regional passengers, however, occurred after 2004 when the two main incumbent airlines' regional carriers (Click and Connect) experienced substantial growth as they began to compete with the entry of the low cost carriers.

With respect to domestic and international passenger traffic in Mexico, in 1989 there were approximately 18.5 million passengers who flew domestic and international routes on national and foreign carriers. By 2008 the number had increased to approximately 53 million passengers, a CAGR of approximately 6 percent.

During this time period Mexico's real Gdp grew at a CAGR of approximately 3.0 percent.[36] Thus, airline passenger traffic in Mexico during the time period grew at close to double the rate of the overall economy. A simple linear regression of the natural log of real Gdp on the natural log domestic passengers results in an income elasticity of 1.06 while a simple linear regression of the natural log of real Gdp on the natural log of domestic and international passengers results in an income elasticity of approximately 1.30. These numbers are somewhat greater than those found in the literature cited above.[37]

Mexico compares well with other Latin American countries in terms of overall airline consumption. Table 2 compares the total number of flights in five Latin American countries in 2008. The data are reported for total flights, total domestic and total international flights.

Table 2
Airline Consumption in Select Latin American Countries in 2008 (000s)

Country	All Flights	All Flights Per 1000 pop.	Dom. Flights	Dom. Flights Per 1000 pop.	Int. Flights	Int. Flights Per 1000 pop.
Argentina	7,667	0.187	4,814	0.117	2,853	0.070
Brazil	44,420	0.224	40,972	0.206	3,448	0.017
Chile	6,287	0.379	4,728	0.285	1,559	0.094
Colombia	13,826	0.316	11,786	0.270	2,040	0.047
Mexico	40,418	0.363	31,170	0.280	9,248	0.083

Source: Associación Latinoamericano de Transporte Aéreo, *Latin America and Caribbean Capacity Analysis 2008*

In terms of total flights (both domestic and international) per 1000 population, Mexico has the second highest of the five countries, .363 compared to .379 for Chile. And it is second to Chile with respect to domestic flights per 1000 population and international flights per 1000 population. According to the data, Mexicans use air travel significantly more than their counterparts in Argentina (.363 compared to .187 for all flights per 1000 population) and Brazil (.363 compared to .224 for all flights per 1000 population) and only slightly more than their counterparts in Colombia (.363 compared to .316 for all flights per 1000 population).

[36] IMF data, at http://www.imf.org/external/pubs/ft/weo/2009/01/weodata/index.aspx

[37] See footnote 8. Of course, these estimates are not comparable with other income elasticity estimates since we did not include price as an independent variable due to lack of data.

V.2 Market Shares and Concentrations

According to SCT data, in 2008 there were 13 airlines offering service in Mexico. Nine airlines were considered trunk airlines while four airlines were considered regional airlines.[38] The total number of competitors in the Mexican airline sector (trunk and regional carriers) has fluctuated somewhat over the years, as can be seen in Table 3.

Table 3
Growth in Trunk and Regional Carriers, 1989-2008

Year	Trunk	Regional	Total	Year	Trunk	Regional	Total
1989	3	10	13	**1999**	5	8	13
1990	4	11	15	**2000**	4	8	12
1991	6	11	17	**2001**	5	8	13
1992	6	11	17	**2002**	5	8	13
1993	6	12	18	**2003**	5	8	13
1994	6	14	20	**2004**	5	5	10
1995	6	13	19	**2005**	7	4	11
1996	5	11	16	**2006**	10	4	14
1997	5	9	14	**2007**	10	4	14
1998	5	8	13	**2008**	9	4	13

Source: *La Aviacion Mexicana en Cifras*, 1989-2008, http://www.sct.gob.mx/transportes/

The year with the highest number of airlines was 1994 when there were twenty while the lowest number of airlines occurred in 2004 when there were ten. The composition of airlines has changed significantly, however, as can be seen from the sharp decline in regional carriers and the sharp increase in trunk carriers. The sharp increase in trunk carriers occurred post 2004 with the entry of a number of low cost competitors, some of which are still in operation today (such as Interjet, Vivaaerobus, and Volaris) and some of which have ceased operation (*i.e.*, Alma and Avolvar). The two large incumbent carriers—Aeromexico and Mexicana—own two of the regional airlines in the SCT data. Aeromexico owns Aerolitoral (Aeromexico Connect) while Mexicana owns Aerovias Caribe (Click). Thus, the number of airline carriers competing with each other is less than the total number of trunk and regional airlines. In 2008 while the SCT data identified 13 airlines offering service, only 11 airlines can be considered as competing with each other. And, since three airlines exited the market in 2008, the number of airlines competing is 8.[39] Appendix I at the end of the paper contains a brief description of the airlines in operation in 2009 as well as the 3 airlines that ceased operating in 2008 and the reasons why they exited the market.

[38] The data include three trunk carriers—Aerocalifornia, Alma and Avolar—that ceased operations in 2008.

[39] In 2009 another airline, Aviacsa, ceased operating in the second quarter further lowering the number of competitors to seven. Press reports indicate the possibility that Aviacsa will resume offering service.

Table 4 presents data on concentration. According to the table the Mexican airline sector has become considerably less concentrated during the period 1989-2008. The table shows the Hirshman-Herfindalh index for domestic airline services in Mexico using domestic airline passengers as the output and defining the relevant market as national, for purposes of construction of the index.[40]

Table 4
HHI, 1989-2008

Year	HHI	No. of Competitors	Year	HHI	No. of Competitors
1989	4396	13	**1999**	2683	13
1990	4353	15	**2000**	3219	12
1991	3976	17	**2001**	2975	13
1992	3300	17	**2002**	2805	13
1993	2913	18	**2003**	2649	13
1994	2694	20	**2004**	2637	10
1995	2933	19	**2005**	2498	11
1996	2984	16	**2006**	2108	14
1997	2997	14	**2007**	1721	14
1998	2733	13	**2008**	1766	13

Source: *La Aviacion Mexicana en Cifras*, 1989-2008, http://www.sct.gob.mx/transportes/ and author's own calculation.

In 1989 the HHI was approximately 4,400 which is considered "highly concentrated" by the U.S. Department of Justice Merger Guidelines standards. By 2008, the HHI decreased to approximately 1750 which is considered "moderately concentrated" by those same standards. Concentration decreased considerably from 1989-1994 at a time when total competitors went from 13 to 20. As discussed above in Section II, this was a period when Mexico first started to liberalize the sector. Concentration then generally increased up through 2000, a period when total competitors decreased down to 12 by 2000. Beginning in 2000, concentration begins a significant decline reaching a level of 1766 by 2008, a period during which total number of competitors remained fairly constant but that marked the entry and growth of the low cost carriers.

The decline in concentration during the period can be explained by the loss of market share of the two major incumbent carriers, Aeromexico and Mexicana, as depicted in Table 5. Prior to the emergence of low cost carriers around 2003, Aeromexico and Mexicana were losing market share to the other "legacy" carriers most notably Aviacsa. Aviacsa's market share went from less than one percent in 1991 to approximately 16 percent in 2005, afterwhich it began to lose considerable share. Another legacy carrier, aerocalifornia, reached a market share high of close

[40] As discussed previously, the consensus is that relevant geographic markets in airline economics consist of point-to-point origin-destination routes. Calculating HHIs assuming a national market may or may not be similar to calculating HHIs on an individual route basis. Unfortunately, data were not available to calculate HHIs on a route-by route basis.

to 9 percent in 2005 aftwhich it also began to lose considerable market share. Aerocalifornia ceased operations in 2008 and Aviacsa ceased operation in the second quarter of 2009.[41] The loss of competition from the exit of some of the other legacy carriers—and the diminshed share of the remaining legacy carriers—was made up by the emergence of the low cost carriers.

Table 5
Market Shares of Aeromexico, Mexicana and Other Carriers, 1989-2008

Year	Aeromexico	Mexicana	Other	Year	Aeromexico	Mexicana	Other
1989	0.374	0.545	0.058	**1999**	0.407	0.283	0.170
1990	0.406	0.518	0.052	**2000**	0.452	0.323	0.186
1991	0.394	0.489	0.077	**2001**	0.434	0.305	0.213
1992	0.412	0.392	0.088	**2002**	0.420	0.295	0.237
1993	0.410	0.333	0.096	**2003**	0.390	0.302	0.273
1994	0.394	0.304	0.087	**2004**	0.390	0.283	0.327
1995	0.406	0.336	0.111	**2005**	0.369	0.278	0.353
1996	0.420	0.331	0.127	**2006**	0.329	0.270	0.401
1997	0.420	0.332	0.131	**2007**	0.286	0.241	0.474
1998	0.403	0.301	0.167	**2008**	0.280	0.240	0.479

Source: *La Aviacion Mexicana en Cifras*, 1989-2008, http://www.sct.gob.mx/transportes/ and author's calculations

Table 6 below shows the growth of the five low cost carriers that entered the market during 2005/2006 period. According to Table 6, low cost carriers captured more than 30 percent of the market in a period of three years. The table also shows that other legacy carriers have been more hurt by the emergence of the low cost competitors than the two main incumbents, Aeromexico and Mexicana. The combined share of Aeromexico and Mexican fell from 64.7 to 52.0 percent since the entry of the low cost carriers, a drop of approximately 20 percent. The combined shares of the other legacy carriers fell from 35.0 to 15.2 percent, a drop of more than 50 percent.

Table 6
Market Shares of Carriers, 2005-2008

	2005	2006	2007	2008
Low Cost Carriers				
Interjet	0.2	5.7	7.0	10.8
Vivaaerobus	0.0	0.3	4.4	4.8
Volaris	0.0	4.0	7.9	12.2

[41] Other legacy carriers include Aeromar, Magnicharters and Lineas Areas Azteca. Lineas Areas Aztecas ceased operation in 2008. Market shares of Aeromar and Magnicharter in 2008 were 1.6 and 2.1 percent, respectively.

Alma	0.0	0.9	3.2	3.1
Avolar	0.1	1.9	3.5	1.8
Total	0.3	12.8	26.0	32.7
Aeromexico/Mexicana	64.7	59.9	52.7	52.0
Other "Legacy" Carriers	35.0	27.2	21.2	15.2

Source: SCT, *La Aviación Mexicana en Cifras, 1989-2008*

Table 7 shows capacity of the low cost carriers compared to the other carriers, especially Aeromexico and Mexicana. The low cost carriers had approximately 15 percent of the airplane capacity in 2008 and 19 percent of the available seat capacity. The fact that low cost carriers have captured over 30 percent of the market with significantly less proportional capacity than the other carriers means that the low cost carriers operate more efficiently than their counterparts. It may also mean, however, that additional growth in market share may only come about with the addition of investment in new planes and equipment.

Table 7
Number of Airplanes and Passenger Seats Available in 2008 by Carrier

Carrier	Number of Airplanes	Number of Available Seats (000)
Mexicana	91	11,640
Aeromexico	94	9,758
Aviacsa	25	3,054
Aeromar	14	664
Magnicharters	7	824
Low Cost Carriers		
Volaris	18	2,562
Interjet	15	2,550
Vivaaerobus	7	1,036

Source: SCT, *La Aviación Mexicana en Cifras, 1989-2008*

V.3 Prices

To our knowledge the Mexican government does not make available (or does not collect) time series data on average airline prices nationally or on a per route basis. Nor have we come across private organizations in Mexico that may collect or make the data available. We do, however, have three observations at three different points of time of average airline prices in Mexico that we can use to reach conclusions about price changes during the period 2000-2009. The first

source is this study. As described in Section VI, we collected price data on approximately 500 point-to-point routes in Mexico in the second and third quarter of 2009. The other two data points on prices are from 2000 and 2008 and were collected by an organization in Mexico called aregional.com.[42] The aregional.com data were based on average prices of 12 routes in Mexico. Two of the routes had distances between 200 and 400 km, four of the routes had distances between 400 and 800 km, and six of the routes had distances greater than 800 km. Mexico City was either an origin or destination in six of the routes and some of the most important routes were included (*e.g.,* Mexico City-Monterrey). In 2000 the data were obtained based upon surveys while in 2008 the data were obtained based upon the airlines' web pages.

In Table 8 we compare the prices in the routes for the three points of time, 2000, 2008 and 2009.[43] According to the data in Table 8, airline prices in the routes analyzed decreased significantly between 2000 and 2008, by approximately 27 percent or a CAGR of -3.8 percent.

Table 8
Price (in pesos) in 11 routes, 2000, 2008, 2009

Route	2000	2008	2009
Mexico-Veracruz	2814	2355	2675
Guadalajara-Puerto Vallarta	4012	3649	2717
Mexico-Monterrey	4353	2670	3642
Mexico-Puerto Vallarta	5649	2947	3457
Culiacan-Guadalajara	5548	3738	3718
Mexico-Tijuana	3441	4395	5349
Mexico-Merida	5324	2640	4725
Guadalajara-Tijuana	6659	3599	3927
Monterrey- Tijuana	5653	3899	4194
Cancun-Monterrey	4893	3292	5133
Los Mochis-Tijuana	5548	2921	5101
Average Price	4641	3405	4058

Source: 2000 and 2008, aregional.com, 2009 database created by author.

In 2009, however, the table indicates that prices on those routes increased by close to 20 percent. It is important to remember, however, that the data sources are different for the 2009

[42] Aregional.com is a "think tank" in Mexico that frequently publishes reports on competition and regulation. The data on airline prices are contained in the article "Competencia en el Mercado del transporte aéreo de pasajeros en México," in the publication by aregional.com *Competencia en sectores estratégicos de México* 2008.

[43] Although the aregional.com study collected data on 12 routes, one of the routes was not in our dataset.

data point compared to the 2000 and 2008 data points and as a result, one should be cautious in interpretations.[44]

V.4 Profitability

Table 9 presents a comparision of two measures of profitability—operating profits and net income—among Latin American Airlines and the two incumbent airlines in Mexico, Aeromexico and Mexicana during the period 2004-2006.

Table 9
Aeromexico, Mexicana and other Latin American Airlines' profitability, 2004-2006

	2006		2005		2004	
Carrier	**Op. profits**	**Net Inc.**	**Op. profits**	**Net Inc.**	**Op. profits**	**Net Inc.**
Aeromexico	(74,677)	(49,538)	13,080	21,521	7,288	44,164
Aeropostal					4,024	(525)
Avianca	90,357	12,889	62,691	(4,768)		
BWIA					(8,295)	(14,628)
Copa Hold.	166,900	134,200	109,200	83,000	82,300	68,600
Gol	328,014	266,138	266,375	220,148	247,558	165,258
LAN	302,622	241,300	141,636	146,601	172,100	163,552
Mexicana	16,000	(19,000)	2,000	(14,000)	15,345	8,720
TAM	509,626	377,944	262,600	183,000	212,000	185,000
TRIP	5,900	4,800				
Varig			(551,703)	(630,911)	(27,230)	(32,839)

World Airline Reports, years 2005-2008.

There is not much publicly-available profit data for Aeromexico and Mexicana after 2006.[45] As can be seen, Aeromexico and Mexicana were not very profitable companies during this period, a period during which the government of Mexico was the principal shareholder for Aeromexico and for Mexicana up until 2005.[46] Mexicana had positive operating profits during the three years but the profits are small compared to its counterparts in Latin America. In 2006 and 2005 Mexicana had negative net income, only 2004 saw positive net income, although relatively small.

[44] Obtaining airline prices requires a standard methodology in order to confidently compare results across time. In our study, we selected lowest price, round-trip fares with all taxes and surcharges included. For some routes, the departure date was less than a week while for other routes it was more than two weeks with a Saturday night stay over. The aregional.com report does not detail the methodology they used to collect prices for these routes.

[45] Aeromexico was delisted from the Bolsa Mexicana de Valores in 2007 after it was acquired by Banamex and Mexicana was acquired in 2007 by a private consortium of Mexican businesses and is also not listed on the Mexican stock exchange.

[46] It is not entirely clear whether Aeromexico and Mexicana's objective function during the period was profit maximization. This fact (plus the lack of publicly-available data post 2006 and the demand shocks experienced by the airline industry in 2008 and 2009) make it difficult to reach conclusions about the level of competition based on profits.

Aeromexico fared the worst of the airlines in the sample in 2006 being the only airline to have negative operating profits and one of only two (the other being Mexicana) to have negative net income. While it earned positive operating profits and positive net income in 2004 and 2005, they were relatively modest compared to the other airlines.

Anecdotal evidence from the industry trade press indicates that Mexican airlines were not very profitable during 2007 and early 2008, prior to the demand shocks (due to the global financial crisis and the H1N1 virus that hit Mexico very hard in the second quarter of 2009) of the late 2008 and early 2009.[47] Also, since 2007 four airlines exited the market, Aerocalifornia, Lineas Areas Azteca and two low cost carriers (Alma and Avolar), see Appendix I for information on the reasons why they exited the market.

VI. Determinants of Domestic Airline Prices in Mexico

In this section of the report we summarize our statistical and econometric analysis of domestic airline prices in Mexico.[48] We collected data on approximately 500 airline routes in Mexico during April-August 2009 to investigate and analyze the relationship between prices and various variables of interest in order to gain insights into the economic and competition characteristics of the sector. The data analysis should also provide policymakers with relevant information that can be used to adopt policies that remove and lower competition barriers and increase competition in the sector and to provide estimates of potential welfare gains from such reform. The data we collected include: the number of existing routes in Mexico and distance per route; the number and type (*i.e.* low cost or traditional) of airlines providing service per route; prices per kilometre for each airline offering service on the route; total passengers flown and total flights in the previoius year per route; important economic characteristics of origin and destination cities and congestion conditions in different airports. We use simple statistical analysis as well as estimate structural econometric models to reach our major conclusions.

The statistical evidence shows that low cost carriers' prices per kilometer (Mexican pesos/km) are significantly lower than the prices per kilometer of the traditional carriers (see Table 3 in Appendix II). Each low cost carrier's mean price is well below the prices of the traditional carriers. The average price of the incumbent carriers is $3.05 pesos per kilometer compared to $1.78 pesos per kilometer for low cost carriers. Thus, average low cost carriers prices are approximately 42 percent lower than average traditional carrier prices, a difference that is statistically significant at the 1 percent level of significance. The prices of the two largest traditional airlines, Aeromexico and Mexicana, are almost identical. The airline with the highest price is Aeromar, a traditional carrier, while the airline with the lowest fares is Vivaerobus, a low cost carrier.

We also find that average prices per route are lower when a low cost carrier is present on the route and the average price per route declines as more low cost carriers are present (see Table 4 in Appendix II). For example, the mean price on a route when no low cost carriers were present

[47] See a 2008 article citing industry analysts who indicated that Volaris, unlike many of its competitors, is profitable, http://www.flightglobal.com/articles/2008/12/05/319789/enrique-beltranena-creating-mexicos-largest-domestic-carrier-in-less-than-three.html. See also a 2008 article that indicating that Aviacsa and Interjet were unprofitable in 2008, http://www.flightglobal.com/articles/2008/09/24/316227/interjet-and-volaris-look-to-exploit-consolidation-in.html.

[48] A detailed write-up of the analysis is contained in Appendix II.

was 3.44. This compares to 2.17, when there was one low cost carrier (a difference of approximately 37 percent) 1.79 when there were two low cost carriers (a difference of approximately 48 percent) and 1.61 when there were three low cost carriers (a difference of approximately 53 percent). The differences compared to 0 low cost carriers are all statistically significant at the 1 percent level. The average price when there was at least one low cost carrier was 2.06, a difference of approximately 40 percent and also statistically different than 3.44 at the 1 percent level. These results provide evidence that mean airline prices in Mexico tend to be significantly lower on those routes where low cost carriers operate.

We find strong evidence that the saturation conditions in the Mexico City airport are having an impact on average prices (see Table 6 Appendix II). Mean prices are significantly higher on the routes where either the origin or destination airport is Mexico City than on routes where Mexico City is not the origin or destimation airport—3.89 compared to 2.61, a difference of 33 percent and statistically significant at the 1 percent level. We also find evidence (see Table 6 Appendix II) that that when Aeromexico and Mexicana provide service on the same route—which happens on 48 percent of the routes analyzed—mean prices are approximately 4 percent lower than when they do not, although this finding is not statistically significant at the 5 percent level.

In order to determine the robustness of these findings, we estimate several econometric models to examine and quantify the main determinants of average airline prices per route. We estimate the following general model:

(1) $$\mathbf{Y} = \mathbf{X}\beta + \mathbf{u}$$

Where: **Y**, the dependent variable, is the average airline price/km per route, **X** is an N x k matrix of sample values of the independent variables, β are the k parameters to be estimated and **u** is the stochastic disturbance. We assume that: E [**u** | x] = 0, which means that the unobserved factors in the regression function are not related systematically to the observed factors. We estimate equation (1) using the ordinary least square (OLS) estimation technique and experiment with linear and non-linear relationships between **Y** and **X**.

Our main policy variables of interest are the existence of low cost carriers on a given route and whether the origin or destination airport was Mexico City, the only saturated airport in Mexico. We create dummy variables for these. In addition to these two independent variables, equation (1) is estimated using a number of additional independent variables: total number of competitors on a given route; a dummy variable controlling for whether Aeromexico and Mexicana compete on the route; the inverse of distance in kilometers between the origin and destination city; total number of passengers that traveled the route in the previous year for the month in which the data were collected; income of the origin city—2007 GDP per capita measured in thousands of Mexican pesos; a variable measuring the maximum price that airports can charge for services such as takeoff/landing fees, platform and security costs, etc; a price discrimination dummy variable with a value of one if the time between the reservation and the departure date is greater than two weeks and the reservation has a Saturday night stay-over, otherwise the variable is zero; and a dummy variable if the destination is a tourist attraction. Finally, for the reasons discussed in Appendix II, we created a dummy variable whose value is one if there is codesharing between Mexicana and Aeromar for the flight and route in question, otherwise the value is zero.

Estimating several versions models of (1) we find that the existence of a low cost carrier on a route is associated with significantly lower prices, holding constant other factors that affect price, (see Table 7 Appendix II). We also find that flights into or out of Mexico City is associated with significantly higher prices, holding constant other factors that affect price. Depending on the model, the percent impact on prices if a low cost carrier is present is between 24 and 30 percent while the percent impact of the Mexico City airport variable ranges between 36 and 46 percent (see Table 8, Appendix II). We also find that competition between Aeromexico and Mexicana is associated with average prices that are between 16 and 31 percent lower and codesharing between Mexicana and Aeromar is associated with average prices that are between 32 and 49 percent higher.

We also estimated equation (1) relaxing the zero-conditional-mean assumption of **u** and assuming that there is contemporaneous correlation between the error term and the low cost carrier variable. Whenever there is contemporaneous correlation between the error term and the regressosr, that regressor is said to be endogenous and the parameter estimates from OLS, β^{OLS}, can no longer be considered unbiased, other estimation procedures can be used to obtain better parameter estimates. Thus, in order to determine the robustness of our conclusions described above, we use instrumental variables to estimate equation (1) and consider three variables to be endogenous: low cost carrier, number of competitors, and number of passengers (see Tables 9 and 10, Appendix II).

Use of IV estimators increases the percentage impact of the low cost carrier to between 30 and 35 percent and increases the impact of the Mexico City dummy variable to between 70 and 80 percent. The impact of codesharing and incumbent competition remains relatively unchanged, although for one of the models the impact of incumbent competition is not significant. Thus, using IV regressions to deal with the possible endogeneity between the low cost carrier, number of carriers and total passengers increases the impact of low cost carriers and Mexico City variable but does not materially affect our major conclusions with respect to codesharing (between Mexicana and Aermar) and incumbent competition on airline prices.

Based upon our econometric point estimates we estimate potential increases in consumer surplus from improving airport conditions in Mexico City and increasing low cost competition throughout the country (Appendix II). To the extent that saturation conditions are eliminated at the Mexico City airport, consumers can gain up to 3 billion US$ annually. To the extent that removing entry and expansion restrictions increases the number of low cost carriers entering unserved areas, consumers can gain up to 300 million US$ annually.

VII. Policy Recommendations

This last section of the paper presents competition policy recommendations that are intended to reduce impediments to competition in the Mexican domestic airline sector. The policy recommendations are divided into two broad categories: (i) access to essential airport facilities, and (ii) removing policy restrictions to entry and expansion.

The saturation/congestion conditions at the Mexico City Airport are a barrier to competition. There is very limited potential competition for these routes. Newer competitors are limited in their

ability to enter or expand airline service at this very important airport in Mexico that comprises more than 60 percent of the domestic passenger service in Mexico. The evidence in this paper indicates that the average price of flights into or out of Mexico City controlling for other factors including airport charges is between 40 and 80 percent higher. In order to lessen the negative impact on competition due to the conditions at the Mexico City Airport, we recommend the following:

1. Implement, as soon as possible, the market-based solutions—*e.g.,* auctions for take-off/landing slots, etc—that the SCT and the Mexico City Airport have been empowered to implement since 2005 but have not done so to date;

2. Modify the pricing rules at the Mexico City Airport so that they are transparent and are set to improve economic efficiency by, for example, taking into account external congestion costs and or other factors within a price cap plan to limit monopoly pricing.

3. Eliminate "grandfather" clauses in the current regulations that favor the incumbent operators' access to essential airport infrastructure.

4. Modify the regulations so that actual and potential entrants are represented in the Committees that administer and allocate the take-off/landing slots.

With respect to entry and expansion, we make the following recommendations:

5. Eliminate the SCT's discretion in awarding concessions and approving new routes and schedules by guaranteeing that any safe airline can get a concession. There are several specific recommendations: (i) concessions should provide the airlines with the authority to provide service on any route, maintaining safety notification requirements on a route-by-route basis; (ii) airlines should be free to change schedules with simple notification; (iii) eliminate the rule that if the airlines does not provide service on authorized routes for 180 then they lose the right to provide the service; (iv) eliminate rule that if the airline does not begin offering service 90 days after receiving approval it loses the right.

6. Increase the limit on foreign ownership (currently at 25 percent) in order to attract additional capital and expertise. Carriers in other countries would likely find the Mexican domestic airline market attractive and increasing the limit could result in additional entry or expansion.

7. Negotiate agreements with other countries to permit cabotage service. As in the previous recommendation, carriers in other countries would likely find the Mexican domestic airline market attractive and permitting cabotage service would result in additional entry and benefit Mexican consumers.

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Appendix I – Mexican Airline Carriers

Mexican Airlines Currently in Operation

1. Aerovías de Mexico, S.A. de C.V. (Aeromexico)

Aerovías de México, S.A. de C.V., operating as Aeroméxico, is an airline based in Mexico City, Mexico. Aeromexico owns Aeromexico Connect, its main feeder airline and in 2008 the companies provided service to over 10 million passengers to destinations in Mexico and internationally.

The companies have about 25% of the domestic market which positions the airline as the largest domestic carrier. Internationally, Aeroméxico holds 12.8% of the Mexican foreign market share, or the second largest Mexican carrier after Mexicana. Aeroméxico and Aeroméxico Connect together operate a total of 650 daily flights to 67 destinations on 4 continents, with a global fleet of 104 airplanes with an average age of approximately 8 years. Aeromexico operates scheduled domestic services and international services to Asia, Canada, Europe, Central America, South America and USA. Its main base is Mexico City International Airport, with secondary hubs at General Mariano Escobedo International Airport, Monterrey and General Ignacio Pesqueira Garcia International Airport in Hermosillo. AeroMéxico is the only Latin American airline that flies to Asia, and was the only airline in Mexico with scheduled services to Europe, until Mexicana initiated its Mexico City to London's Gatwick service in January 2009. Aeromexico was one of the founding members of Sky Team, the second largest alliance in the world.

The Consorcio Aeromexico, S.A. de C.V., was created on January 24, 2006 to replace Cintra, S.A. de C.V. In October 2007, Consorcio Aeromexico, S.A. de C.V. (Aeromexico, Aeromexico Connect, 50% of Aeromexpress, Seat and Alas de América), was acquired by a group of 15 Mexican investors headed by José Luis Barraza, together with Grupo Banamex, that won the bid published by the Instituto de Protección al Ahorro Bancario.

2. Mexicana de Aviación, S.A. de C.V. (Mexicana)

Mexicana was the first airline established in Mexico. Mexicana owns and operates MexicanaClick formerly Click Mexicana which first started as a low-cost airline based in Mexico City, Mexico and later changed its market and became Mexicana's regional operator, serving most of Mexicana's domestic routes between more than 25 Mexican cities. In 2008 the airlines provide service to over 11 million passengers to destinations in Mexico and internationally.

Mexicana and Click have a combined fleet size of 96 and have a total of 48 destinations. Mexicana is the country's largest international airline in terms of most passengers transported, operating services to North America, Central America, the Caribbean, South America and Europe. In 2008 Mexicana and Click were invited to the Oneworld alliance at the member and associate level, respectively. Mexicana’s principal hub is Mexico City International Airport, with secondary hubs at Cancún International Airport and Don Miguel Hidalgo y Costilla International Airport, Guadalajara. Mexicana's main competitor is Aeroméxico, although the two companies "code-share" on several routes and were merged for more than a decade. Mexicana is North Americas oldest airline and the world's third oldest airline operating under the same name, after

the Netherlands' KLM and Australia's Qantas. Despite government announcements indicating that the airlines were going to be privatized, that move did not occur until November 29, 2005, when Cintra sold Mexicana and its subsidiary, Click Mexicana, to the Mexican hotel chain Grupo Posadas for USD$165.5 million.

Click is Mexico's first low-cost airline. Mexicana employs Click mostly on domestic operations while Mexicana focused on international and longer domestic routes. Click flies primarily in the Yucatan Peninsula and northern Mexico and its sole international destination is Havana, Cuba. Mexicana is considering the possibility of expanding Click's fleet to incorporate A319 which could serve destinations in Central America and the Caribbean. Click currently has 22 F100 aircraft in an all economy-plus layout.

3. ABC Aerolineas (“Interjet”)

Interjet is a low cost airliner headquartered in Toluca with its principal base of operations at the Toluca airport and Mexico City International airport. In 2008 it provided service to approximately 3 million passengers to destinations in Mexico. It operates scheduled serevice between Toluca and 15 other Mexican cities. Interjet started operations on December 1, 2005 and currently has a fleet of 15 Airbus A320-214 at an average age of 5 years. Interjet is wholly-owned by the Mexican conglomérate Aleman Group.

4. Aeroenlaces (“VivaAerobus”)

VivaAerobus is a low cost airliner that started operations on November 30, 2006 with its hub at General Mariano Escobedo International Airport (MTY), in Monterrey, Mexico. In 2008 it provided service to approximately 1.4 million passengers.

The airline currently flies between Monterrey and 21 other Mexican cities (September 2008). VivaAerobus has a fleet of 9 Boeing 737-300 and an average age of 22 years. VivaAerobus is co-owned by the Ryan family, founders of Ryanair and the Mexican bus company IAMSA. The Ryans joined with Maurice Mason of Kite Investments to establish "RyanMex" to facilitate the Irish family's investment in the Mexican airline. RyanMex hold 49 percent of shares in the airline, while IAMSA will have the remaining majority stake. It started off with an initial investment of $50 million and two Boeing 737-300 airplanes bearing its vivid green and red dots logo. The airline has served 1.3 million passengers in its first year of operations and anticipates handling 2.4 million passengers in 2008.

On November 5, 2007 the airline received approval from the US Department of Transportation to operate to Austin-Bergstrom International Airport, initially serving the Mexican destinations of Cancún, Monterrey, Guadalajara and León. Flights to the South Terminal Austin began on May 1, 2008.

5. Aviasca

Aviacsa is an airline based in Monterrey, Mexico that operates domestic services radiating from hubs in Monterrey, Mexico City, Guadalajara and Leon and provides international service to Las Vegas, Nevada. In 2008 it provided service to approximately 2.7 million passengers to 18 destinations and it operates a fleet of 21 Boeing 737-200 and 3 Boeing 737-300.

The airline was established on May 5, 1990 by the government of the Mexican state of Chiapas in order to fulfill the transportation needs of the fast-growing communities located in that state. Currently, the airline is owned by Aeroexo S.A., an airline charter company based in Monterrey. In June 2009 the Mexican government grounded 25 aircraft after officials said that the airline had maintenance irregularities. The airline is appealing this ruling citing, among other things, reports from the FAA and third party inspectors which have deemed the airline to be safe.

6. Vuela (Volaris)

Volaris is a low cost airline based in Toluca and headquarterd in Santa Fe, Mexico City. In 2008 it provided service to approximately 3.4 million passengers to 23 destinations and it has a fleet of 19 Airbus A319-100 and 2 A319-100 with an average age of approximately 3 years and it has orders for 18 more A319-100 and 8 A319-100s. Volaris began operations in March 2006.

Volaris is the commercial brand of the Mexican group Concesionaria Vuela Compañía de Aviación S.A. de C.V., a low-cost airline based in the city of Toluca, Mexico State and the fastest growing Mexican airline. Its headquarters are located in Santa Fe (Mexico City) and its operational base are located at the Lic. Adolfo López Mateos International Airport (TLC) in Toluca, only 50 kilometers (31 miles) west of Mexico City. Volaris provides free transportation from Toluca Airport to Mexico City's Santa Fé area.

On Nov 10, 2008 Volaris announced a codeshare agreement with Southwest Airlines. Southwest and Volaris plan to announce their flight itineraries and other details early in 2010, subject to government approval. Volaris has government permission to fly outside Mexico. On Feb 2 2009 Volaris filled an application with US DOT requesting permission to serve Fort Lauderdale from its base at Toluca using its A319 and A320's. On April 27th, 2009 Volaris announced start-up of operations to Los Angeles International Airport and Oakland International Airport, within the San Francisco Bay Area for the latter; nonstop service to/from Toluca and Guadalajara will happen with both U.S. airports. Volaris also announced that Fort Lauderdale, Las Vegas, New York, Orlando will be some of the next U.S. destinations it will serve. On May 16, 2009 volaris.com.mx announced that it will also be serving nonstop service from LAX to Hermosillo, and will also serve LAX to Cancun with a layover in Guadalajara.

7. Aeromar

Aeromar is an airline based in Mexico City, Mexico that operates scheduled domestic services to 18 destinations. In 2008 it provided service to approximately half a million passengers. It has a fleet size of 14 consisting of 10 ATR 42-320 and 4 ATR 42-500. The airline was established on 29 January 1987 and started operations on 5 November 1987 as Transportes Aeromar. It is owned by Grupo Aeromar (publicly listed) (99.99%) and has 894 employees (at March 2009).

8. Grupo Aero Monterrey (MagniCharters)

The airline was established in 1994 and started operations in January 1995. Its hub is Monterrey and provides service to 12 cities in Mexico and internationally to Varadero, Cuba. In 2008 it provided service to approximately 650 million passengers. MagniCharters has a fleet of six airlines consisting of three Boeing 737-200 and three Boeing 737-300.

It is owned by Augusto Adolfo Bojorquez Maza (25%), Gabriel Antonio Bojorquez Maza (25%), Jose David Bojorquez Maza (25%) and Luis Fernando Bojorquez Maza (25%). In June 10, 2008, the SCT, Mexico's federal Secretariat of Communications and Transport, suspended Magnicharters operations due to a lack of proper maintenance and large debts, and gave the airline 90 days to correct the problems and pay the debts. The problems were solved and on June 20, ten days later, the airline restarted regular operations.

Mexican Airlines that have recently exited the Market

1. **Aerocalifornia**

Aero California, S.A. de C.V. was an airline based in La Paz, Baja California Sur, Mexico that had been in operations since the late 1980s. In 2008 it provided service to approximately half a million passengers. Its main base is in Manuel Márquez de León International Airport, La Paz. The airline served 17 destinations in Mexico but it has been officially grounded since July 2008 over unpaid ATC debts.

On August 2, 2008 it was reported that Aerocalifornia would cease operations permanently and would likely file for bankruptcy, however there has not been any official statement from the company. Its slots at Mexico City International Airport were taken by Interjet.

Aerocalifornia is not in an official bankruptcy, yet it is effectively out of business, due to lack of payment of airports ground and support services and not paying the Mexican Air Force Air traffic control taxes. The Ministry of Transportations of Mexico later allowed Interjet to buy Aerocalifornia's last two hubs at La Paz, Baja California Sur Manuel Márquez de León International Airport and Mexico City International Airport.

2. **Aerolineas Mesoamericans (Alma)**

Aerolíneas Mesoamericanas, S.A. de C.V., operating as ALMA de Mexico, was a low-cost airline based in Guadalajara, Mexico that began operations in 2006. In 2008 it provided service to approximately 900,000 passengers. It suspended all service on November 7, 2008. The airline once operated flights to more than 18 domestic destinations, with future plans for international service to the USA. Its main base was Don Miguel Hidalgo y Costilla International Airport, Guadalajara.

By the end of 2007, ALMA had grown its fleet to 18 aircraft and had announced plans to expand to 30 aircraft within the coming year, including two new CRJ900 aircraft on order directly from Bombardier. ALMA was then considered one of the fastest growing regional airlines in Mexico. This turned out to be the high point in the airline's history. Within months ALMA was feeling the effects of soaring fuel prices and increased competition. In early 2008 the company indefinitely deferred further aircraft deliveries and then cut capacity. By the end of the summer the fleet had dropped to just 12 aircraft.

On November 7, 2008, ALMA announced on its website that it was ceasing all operations, effective immediately, citing the global economic crisis, the increase in fuel prices and the devaluation of the Mexican peso. The airline had not made any backup plans for its booked passengers. As a result, all such customers had effectively lost their money unless they were

willing to make a claim to PROFECO, which stated that any such claim could literally take years to resolve. Aeroméxico offered to reprotect passengers, but it charged 999 pesos per segment subject to G class availability.

3. Avolar

Avolar Aerolíneas, S.A. de C.V. was a low-cost airline based in Tijuana, Baja California, Mexico, with corporate offices in Tijuana that began operations in 2005. In 2008 the airline provide service to approximately half a million passengers.

The airline operated a domestic network of 17 cities as of November 2007. Avolar's main base was located at the sole large-hangar facility at the General Abelardo L. Rodríguez International Airport in Tijuana. On August 4, 2008, the Mexican Ministry of Communications and Transports suspended all Avolar operations, due to tax debts leaving thousands stranded at Tijuana Airport. On August 8, 2008, the airline resumed all flights. On late night of October 3, 2008, Mexico's aviation authorities again suspended Avolar operations; the airline canceled flights from Tijuana International Airport that were bound for Guadalajara and Cuernavaca at that time without any previous warning, leaving stranded 160 passengers at the airport. However, 13 hours later, on October 4, the airline ressumed all services normally. On October 28, 2008, Mexico's Communications and Transports Secretariat (SCT) finally ceased Avolar from all its operations, due to the illegal operations of the airline after its airspace operative concession had expired the previous day, on October 27.

4. Lineas Areas Azteca

Líneas Aéreas Azteca was an airline based in Mexico City, Mexico that began operation in 2001 and ceased operations in 2007. In 2006 it provided service to approximately one million passengers. It operated domestic scheduled services and international services to the USA. Its main base was Mexico City International Airport, with a hub at General Abelardo L. Rodríguez International Airport, Tijuana.

Operations of the airline were suspended by the government in March 2007 due for safety problems, and in October 2007 the Mexican airline asociation allowed it to restart operations. However, according to the Dirección General de Aeronáutica Civil (DGAC) of the Secretariat of Communications and Transport, it ceased operations on October 10, 2007, for not having a good financial statement, after the suspension on March 2007.

Appendix II – A Statistical & Econometric Analysis of Airline Prices in Mexico[49]

Data Collection

We collected data on the airline sector in Mexico to investigate and analyze the relationship between various variables of interest in order to gain insights into the economic and competition characteristics of the sector. The data analysis should also provide policymakers with relevant information that can be used to adopt policies that remove and lower competition barriers and increase competition in the sector and to provide estimates of potential welfare gains from such reform. We collected data on: the number of existing routes in Mexico and distance per route; the number and type (*i.e.* low cost or traditional) of airlines providing service per route; prices per kilometre for each airline offering service on the route; total passengers flown and totoal flights in the previous year per route; important economic characteristics of origin and destination cities and economic conditions at the different airports such as the price airports charge for airport services and congestion conditions in different airports, to name a few.[50] We use simple statistical analysis as well as estimate structural econometric models to reach our major conclusions.

The SCT provides passenger information by route—monthly and yearly passengers travelled and total flights—for approximately 600 point-to-point routes in Mexico in 2008.[51] We believe that these 600 routes roughly equal the population of routes in Mexico. We collected data on approximately 500 of these routes.[52] Airline price data were collected during the period April through August 2009.[53]

We began by identifying the total number of airlines offering service in Mexico based upon information provided by the SCT in 2008.[54] The SCT identifies trunk and regional carriers. Trunk carriers tend to fly larger aircraft and provide service throughout Mexico while

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[49] I thank Douglas Umana for his excellent assistance in data gathering and, especially, in data analysis. Many thanks also to Craig Conrath and Ernesto Estrada for their many insights and suggestions. I especially thank Severin Borenstien, Steve Morrison and Jose Gomez Ibanez for their review and significant contributions to the analysis. All errors are my responsibility.

[50] The only airport in Mexico that was operating under conditions of "saturation," as defined by the Sectetariat of Comunicaciones y Transporte, was Mexico City. Our dummy variable controlling for airport saturation conditions is thus a dummy variable for whether the origin or destination is Mexico City.

[51] Secretaria de Comunicaciones y Transporte, *La Aviacion Mexicana en Cifras*, 1989-2008, http://www.sct.gob.mx/transportes/. The total number of routes was 589.

[52] Specifically, we collected data on 497 routes. The difference between the 589 routes identified in 2008 and the 497 routes we collected can be explained, in part, by seasonality—some of the 589 routes are not flown during the months we collected our data—and by the possibility that some of the routes are no longer provided. A review of the data show that these missing routes where proportionally lower demand routes than the average route for which we did obtain information. The mean for these routes was 159 flights per year compared to the mean of 887 flights per year for our data.

[53] This time period is very atypical for the Mexican economy and the airline sector in Mexico. Mexico was hit very hard by the U.S. recession in 2008-2009. And the H1N1 virus epidemic was first reported in Mexico in late April 2009 and subsequently caused a severe contraction in travel to and from and within Mexico.

[54] See footnote 51.

regional carriers tend to fly smaller aircraft and provide air travel within discrete geographical areas of Mexico. In 2008 the SCT data show a total of 13 airlines (both regional and trunk) providing domestic service in Mexico and we began our data collection using these airlines. Of the 13 airlines, three ceased operating sometime in 2008 (these airlines were Aerocalifornia, Alma, and Avolar). This left 10 airlines for data analysis. In 2008 the SCT data shows only four regional airlines, a number that is significantly lower than in earlier years. Of the four airlines, however, two are owned by the two large incumbent trunk airlines, Aeromexico and Mexicana. Aeromexico operates Aeroliteral (Aeromexico Connect) while Mexican operates Aerovias Caribe (Click). These two regional carriers provided service to more than 85 percent of the passengers flying on regional routes as determined by the SCT. Our data analysis below did not distinguish between the incumbent operators—Aeromexico and Mexicana—and their respective regional subsidiaries—Connect and Click, respectively.[55] Thus we were left with 8 airlines for data analysis when we commenced data collection.[56]

For each route identified by the SCT we searched the web sites of each of the airlines to determine whether the airline provided service on the route.[57] We began by selecting a departure and return date and collected a price quote for those dates for *each* airline that offered service on the route. That is, generally the same departure and return dates were used for the price quotes for each airline that provided service on the route. If the airline offered service for that route, we obtained a price quote from the airline's website for the lowest quoted round-trip service.[58] For each airline that provided service on the route we attempted to obtain price quotes for the same departing/returning dates for all carriers. When this was not the case the difference in date was generally within plus or minus one calendar day. This occurred in less than 10 percent of the observations. For each route we thus have a price quote for each airline providing service on the route and calculated an *un-weighted* lowest available average fare across all carriers serving the route which was used as the dependent variable in the study.

Some additional comments about the dependent price variable are in order. First, the departure and return date were used to create dummy variables for each route (and thus each observation) that proxied whether prices were discriminating among business or leisure travelers. If the departure and return date were taken 2-3 weeks in advance and required a Saturday night stay, we considered the price quote as one for a leisure

[55] Aeromexico and Mexicana did not have separate web sites for their respective subsidiaries and it was not always clear for a given route whether the flight would be provided by the subsidiary. Therefore, average prices in this study for Aeromexico and Mexicana represent average prices for all flights offered by these airlines including flights offered by their respective subsidiaries.

[56] This number was further refined during our data collection process because one airline, Aviacsa, ceased providing passenger service shortly after data collection began. The airline was shut down by the government for a number of reasons, and although in press statements the airline expects to provide service again as of the end of our data collection it had not resumed service.

[57] All the airlines had a functioning website that allowed customers to search different itineraries and make reservations.

[58] Prices included all applicable taxes. Where a carrier offered only one-way flights the datawere not collected—this was the case for some Interjet and Volaris observations.

passenger. Since we collected price quotes from each airline for the same departure and return date, each observation has a dummy variable ("leisure" variable) indicating whether the departure date for the route was greater than two weeks and required a Saturday night stay.[59] Another dummy variable ("non-leisure" variable) was created if the departure date was less than 7 days in advance and did not require a Saturday night sleep over.[60] The choice in the departure and return date (and thus whether the route is considered a leisure or non-leisure route) was random.

Second, when an option between a non-stop and one-stop flight was given on an airline site the former option was selected as long as the prices were the same. If they were not the same then the lowest price option was selected.[61]

Third, the route A-B-A is considered a different route than B-A-B. For example, one observation was for the route Mexico City to Cancun to Mexico City and another observation was for the route Cancun to Mexico City to Cancun. We found that prices on these routes were somewhat different.[62]

Variables Used & Descriptive Statistics

Table 1 below presents the variable names and data sources used in the study as well as a description of the variable and, where necessary, how the variable was created. Some of the variables are proxies attempting to measure unobservable characteristics. For example, the leisure and nonleisure variables attempt to measure a customers' willingness to pay by how far in advance from departure the price quote was obtained and whether a Saturday night stay was required. The tourist destination variable (touristdest) was obtained by consulting a Mexican tourist industry website that highlights tourist destinations in Mexico and by engaging in research to determine whether the destination was more geared toward tourists or businessmen and women. The airport saturation variable measures whether the origin or destination airport is operating under conditions of saturation, as determined by the SCT. Mexico City is the only airport operating under such conditions as such this is a dummy variable capturing the effects of flying into or out of Mexico City. When an airport is saturated, like Mexico City, it means that the number of airlines using take-off and landing slots is at a maximum during certain times of the day

[59] Unfortunately we did not begin collecting whether the departure and return dates were 2-3 weeks in advance and required a Saturday night stay for the first 60 route observations. This explains why the leisure variable has 437 observations while the other variables have 497 observations.

[60] We did collect this information for all the routes in our sample and thus have 497 observations for this variable.

[61] Flights with 2 stops were not considered even though they might have presented a cheaper alternative (this was seldom the case with Mexicana). The reason for this was the unlikely preference of a customer to travel within Mexico with 2 stops (some flights like this lasted several hours) and the substantial reduction in the average price that this choice entailed.

[62] This could be due to airlines charging different fares for these routes, *i.e.*, charging different prices for roundtrips from Mexico to Acapulco and Acapulco to Mexico. It could also be due to the fact that airline prices for this study were collected over a 4-5 month period.

and no further flights can take off or land. When this occurs the SCT is empowered to implement reforms to alleviate the levels of congestion.

TABLE 1
VARIABLES USED IN STUDY

Variable Name	Variable Description	Source
Price	Average roundtrip price per route in Mx pesos per kilometer for all airlines offering service	Respective airlines'websites
Distance	Distance in kilometres of non-stop roundtrip travel between origin and destination	www.world-airpot-codes.com
pass08	Number of passengers in 2008 for the month the data were collected (in 000)	SCT
gdp07	2007 nominal Gdp per capita of the origin city in Mx pesos (in 000)	INEGI & CONAPO
nonleisure	Dummy variable, 1 if data collected less than 1 week before departure,	N/A
leisure	Dummy variable, 1 if data collected more than 2 weeks in advance and requires a Saturday night stay	N/A
touristdest	Dummy variable, 1 if destination is a tourist destination,	Consejo de Promocion Turistica, http://www.cptm.com.mx/index.jsp, and own research
Airportsat (Mexico City)	Dummy variable, 1 if destination or origin airport is "saturated;" only Mexico City is saturated	Own research
airportcost	The average of the two (origin & destination) airport charges in pesos in 2007 covering the cost of using the airport, takeoff/landing fees, platform and secrutity costs	Comision Federal de Competencia
ncomp	Number of airlines offering service on the route	Own research
Nlcc	Number of "low cost" carriers offering service on the route	Own research
lcc	Dummy variable, 1 if a low cost carrier offers service on the route	Own research
incumbentcomp	Dummy variable, 1 if there is competition between the two incumbent airlines, Aeromexico and Mexicana on the route	N/A
cdshmexmar	Dummy variable, 1 if there is code sharing between Mexicana and Aeromar on the route	Own research

Source: *La Aviacion Mexicana en Cifras*, 1989-2008, http://www.sct.gob.mx/transportes/

A list of the total number of possible competitors was obtained from the SCT. As described above, we used this list to determine whether the airline offered service on the route in question and thus created the independent variable ncomp, total number of competitors providing service on the route. We identified three competitors as being low-cost

competitors, these were Intejet, Vivaaerobus, and Volaris and used this to create the dummy variable, lcc, indicating the presence of a low cost carrier on the route and the variable nlcc, indicating the total number of low cost carriers on the route.

Table 2 below presents the descriptive statistics for the variables used in the study. Some of the more interesting findings are those on mean prices, number of competitors (ncomp) per route, number of low cost competitors (nlcc) per route—and the existence of at least one low cost competitor (lcc) per route—whether the two main incumbent carriers compete (incumbentcomp) and whether the destination or origin airport is saturated (airportsat).

TABLE 2
DESCRIPTIVE STATISTICS

Variable Name	Obs	Mean	Std. Dev.	Min	Max
Price	497	2.87	2.09	0.64	14.29
Distance	497	916	611	58	3,233
distance (lcc)(1)	207	1125	635	214	3233
distance (non-lcc)(2)	290	768	549	58	3171
pass08	497	4.84	10.55	0	90.29
pass08tot	497	54.29	121.39	0	1,047.73
gdp07	497	120.96	86.80	41.94	776.943
Nonleisure	497	0.47	0.50	0	1
leisure(3)	437	0.54	0.50	0	1
Touristdest	497	0.25	0.43	0	1
Airportsat (Mexico City)	497	0.20	0.40	0	1
Airportcost	491	1666.92	132.41	1375	1939
Ncomp	497	2.20	1.14	1	7
Nlcc	497	0.55	0.76	0	3
Lcc	497	0.42	0.49	0	1
Incumbentcomp	497	0.48	0.50	0	1
Cdshmexmar	465	0.19	0.39	0	1
load08	61	0.63	0.12	0.27	0.90

(1) Average distance flown by low-cost carriers; (2) Averge distance flown by non-low-cost carriers; (3) There are only 437 observations for the leisure variable because we did not track this for the first 60 observations collected.

The data show mean airline prices are $2.86 Mx peso/kilometer. Applying an exchange rate of 13 Mx pesos per US$ and converting kilometers to miles, we obtain a figure of approximately $US 0.37/mile. According to Morrison and Winston, in 2007 U.S. revenue

per passenger mile was approximately $US 0.13/mile.[63] Thus, average airline prices in Mexico in 2009 were almost three times higher than average airline prices in the U.S. in 2007.[64]

The data reveal that the mean number of competitors on the average route in Mexico is 2.2. Morrison and Winston found the average number of effective competitors per route in the U.S. in 2007 to be approximately 2.3.[65] The mean value of the number of low cost competitors on a route is 0.55 and a low cost competitor was present on 42 percent of the routes analyzed. Competition between the two incumbent carriers, Aeromexico and Mexicana, occurred on 48 percent of the routes and 20 percent of the routes involved the Mexico City airport, the airport that was saturated, as defined by the Secretariat of Communications and Transport. Approximately 25 percent of the flights were to tourist destinations.

Table 3 below presents summary price statistics by airline and by type of airline, *i.e.*, whether the airline is a low cost airline or whether it is an incumbent airline. As mentioned above, the three low cost airlines we identified in this study are Interjet, Vivaaerobus and Volaris while the "traditional" carriers are Aeromexico, Mexicana, Aeromar, Aviacsa and Magnicharters. The data summary in Table 3 indicates that low cost carriers prices per kilometer are significantly lower than the prices per kilometer of the traditional carriers, although as the table reveals low cost carriers tend to fly longer routes. Each low cost carrier's mean price is well below the prices of the traditional carriers.[66] The average price of the incumbent carriers is $3.05 pesos per kilometer compared to $1.78 pesos per kilometer for low cost carriers. Thus, average low cost carriers prices are approximately 42% lower than average traditional carrier prices, a difference that is statistically significant at the 1% level of significance. The prices of the two largest traditional airlines, Aeromexico and Mexicana, are almost identical. The airline with the highest price is Aeromar, a traditional carrier, while the airline with the lowest fares is Vivaerobus, a low cost carrier.

[63] See, "Competition in the Airline Industry," Hearing Before the Judiciary Committee Antitrust Taskforce United States House of Representatives, April 24, 2008, Statement of Steven A. Morrison and Clifford Winston, "The State of Airline Competition and Prospective Mergers."

[64] Of course demand and cost characteristics, including the level of competition, in the U.S. and in Mexico vary greatly and can help explain the difference.

[65] See footnote 63.

[66] As shown in Table 2, however, the low cost carriers average distance traveled is significantly greater than the average distance traveled by the traditional carriers, which results in lower prices/km for the low cost carriers. Thus care should be used in interpreting these results. The econometric estimates further below controls for distance, as well as other variables, when comparing low cost carrier to non-low cost carrier fares.

TABLE 3
DESCRIPTIVE PRICE STATISTICS BY AIRLINE AND TYPE OF CARRIER

Airline	Obs	Average distance/route	Mean	Std. Dev.	Min	Max
"Traditional" Carriers						
Aeromexico	354	964	2.88	1.90	0.75	15.41
Mexicana	347	866	2.98	1.37	0.95	15.24
Aeromar	97	677	5.15	3.09	1.25	14.36
Aviacsar	10	869	2.90	1.37	0.95	5.20
Magnicharter	13	803	2.45	0.97	1.46	4.40
Average	465		**3.05**			
"Low Cost"Carriers						
Interjet	145	977	2.01	0.91	0.90	4.70
Vivaaerobus	46	934	1.32	0.45	0.71	2.72
Volaris	82	1496	1.39	0.44	0.70	2.99
Average	207		**1.78***			

*Significant at the 1% level.

Table 4 below presents descriptive price information summarized by the number of low cost carriers on a route. Price is the average price for all airlines (both low cost and traditional) that offer service on the route in question. For example, the mean price on a route when no low cost carriers were present was 3.44. This compares to 2.17, when there was one low cost carrier (a difference of approximately 37%) 1.79 when there were two low cost carriers (a difference of approximately 48%) and 1.61 when there were three low cost carriers (a difference of approximately 53%). These differences compared to 0 low cost carriers are all statistically significant at the 1% level. The average price when there was at least one low cost carrier was 2.06, a difference of approximately 40% and also statistically different than 3.44 at the 1 % level. These results provide evidence that mean airline prices in Mexico tend to be significantly lower on those routes where low cost carriers operate.

TABLE 4
DESCRIPTIVE PRICE STATISTICS BY "LOW COST" CARRIERS

"Low Cost"Carrier	Obs	Mean	Std. Dev.	Min	Max
1 LCC	157	2.17*	1.08	0.81	5.36
2 LCC	34	1.79*	0.49	0.91	2.98
3 LCC	16	1.61*	0.48	0.95	2.60
At least 1 LCC	207	2.06*	0.99	0.81	5.36

*Less than the mean of 0 LCC at 1% level of stastistical significance.

Table 5 below presents descriptive price statistics summarized by the number of competitors on a route and whether there was a low cost carrier competing on the route. For example, the first row indicates that the mean price on a route with only one competitor was 2.74. The mean price, however, was 1.90 on routes where there was only one competitor and that one competitor was a low cost carrier, a difference of approximately 30% and significant at the 2.5% level. The same is the case for routes with two and three competitors. The mean price on routes with two competitors was 3.06, but when at least one of the two competitors was a low cost carrier the mean price decreased to 2.03, a difference of approximately 34%. For three competitors comparable numbers are 3.20 and 2.10, a difference of approximately 34%. Interestingly, mean prices tend to increase as the number of competitors increase from one to three, afterwhich mean prices decrease.

TABLE 5
DESCRIPTIVE PRICE STATISTICS BY "LOW COST" CARRIERS & NUMBER OF COMPETITORS

Number of Competitors	Price	Std. Dev.	Number of Competitors & at least 1 LCC	Price	Std. Dev.
1	2.74	1.95	1	1.90**	1.18
2	3.06	2.29	2	2.03*	0.86
3	3.20	2.35	3	2.10*	1.00
4	2.22	1.03	4	2.18	1.07
5	2.03	0.97	5	2.03	0.97
6	1.74	0.40	6	1.74	0.40
7	1.48	-	7	1.48	-

*Statistically significant at the 1.0% level of significance, ** at 2.5% level of signficance

Finally, Table 6 below presents descriptive price statistics summarized by whether there is competition on a route between the two incumbent operators, Aeromexico and Mexicana, and whether either the origin or destination airport is operating under conditions of "saturation" which means it is difficult for competitors to obtain slots to operate flights. As mentioned, Mexico City is the only airport that is saturated so the variable measures the average difference in airline prices in Mexico City compared to all other airports in Mexico. Mean prices on routes where Aeromexico and Mexicana compete with each other are approximately 3.8% lower than mean prices on routes where they do not compete. The difference, however, is not statistically significant. With respect to Mexico City prices, mean prices are significantly higher flying into or out of Mexico City. The mean price on routes to and from Mexico City is 3.89 compared to 2.61 for other airports, a difference of approximately 33% and statistically significant at the 1% confidence level. As discussed further below, since Mexico City's airport is saturated, this condition is having an impact on Mexico City prices for a number of reasons, including the lack of potential competition and high entry barriers.

TABLE 6
DESCRIPTIVE PRICE STATISTICS BY INCUMBENT COMPETITION & AIRPORT SATURATION (MEXICO CITY)

	Obs	Mean	Std. Dev.	Min	Max
Incumbent competition present	237	2.81	1.88	0.82	12.46
Incumbent competition not present	260	2.92	2.27	0.64	14.29
Airport not saturated	397	2.61	1.72	0.64	12.27
Airport saturated (Mexico City)	100	3.89*	2.96	1.16	14.29

*Statistically significant at the 1% confidence level

Econometric Model Estimations

OLS Estimators

In the previous section we found, based on simple statistical analysis, that average prices were approximately 40% lower on routes where at least one low cost competitor was present and that the difference was statistically significant. We also found a statistically significant price difference on those routes involving Mexico City, where prices were approximately 33% lower compared with non-Mexico City routes, the only saturated airport in Mexico. And we found that competition between the two incumbent carriers resulted in prices that were approximately 5% lower, although the difference was not statistically significant.

In this section we estimate econometric models to determine whether these conclusions hold. We estimate parameters using ordinary least squares (OLS) and instrumental variables (IV) to account for the possible endogeneity in some our our independent

variables. We have observations on close to 500 domestic point-to-point routes in Mexico and have data on, *inter alia*, average prices per route, distance per route, previous years' passengers and flights flown per route, income of origin city, whether destination city is a tourist attraction, the number of competitors and low cost competitors per route, whether the origin or destination airport is Mexico City (the only saturated airpot in Mexico), the average of the two (origin & destination) airport charges in pesos in 2007 covering the cost of using the airport, takeoff/landing fees, platform and secrutity costs, etc, and whether the two main incumbents compete on the route. We estimate several models to examine and quantitify the main determinants of average prices per route. Specifically, we estimate the following general model:

(1) $$\mathbf{Y} = \mathbf{X}\beta + \mathbf{u}$$

where **Y**, the dependent variable, is the average price per route, **X** is an N x k matrix of sample values of the independent variables, β are the k parameters to be estimated and **u** is the stochastic disturbance. We assume that: E [**u** | x] = 0, which means that the unobserved factors in the regression function are not related systematically to the observed factors.[67] We estimate equation (1) using OLS and experiment with different specifications and linear and non-linear relationships between **Y** and **X**.

Our main policy variables of interest are the existence of low cost carriers on a given route (lcc) and the impact that saturation conditions in the Mexico City airport are having on prices (airportsat). The sign and magnitude of these variables can provide evidence on the potential gains that can be expected from implementing good competition policy in the sector. Policymakers can influence the existence of low cost carriers on routes, perhaps indirectly, by enforcing competition law and enacting sound competition policies that remove impediments to the entry and expansion of competitive airline suppliers.

With respect to the impact of saturation conditions in the Mexico City airport, Mexico City is different in many ways from other city airports and we attempt to control for these factors through other independent variables such as average distance per route, income, demand, etc. We further include a variable (airportcost) measuring the maximum price that airports can charge for services such as takeoff/landing fees, platform and security costs, etc. Adding this variable controls for the fact that airline prices are likely higher when airports charge higher prices, *ceteris paribus*. We argue, therefore, that the Mexico City dummy variable (airportsat) thus picks up: (1) the impact of very high barriers to entry at the Mexico City airport, and (2) the lack of potential competition at the Mexico City airport—two competition policy concerns that can be addressed by policmakers by implementing market-based mechanisms to alleviate slot congestion at the Mexico City airport and ensure that slots are utilized in the most efficient manner.

There are several additional competition independent variables that we include in estimating equation (1). We include the total number of competitors on a given route. All else equal, as the number of competitors increases we would expect more intense

[67] Further below we relax this assumption and calculate parameters based upon the instrumental-variables estimator.

competition and lower prices.[68] We also include a dummy variable whose value is one if the two incumbent operators—Aeromexico and Mexicana—compete and offer service on the route, otherwise the variable is zero. The sign and magnitude of this variable can provide some evidence on the strength of competition between the two major airlines in Mexico. Finally, we include a dummy variable whose value is one if there is codesharing between Mexicana and Aeromar for the flight and route in question, otherwise the value is zero. Upon reviewing the data we noticed that some Mexicana and Aeromar prices were quite high and upon further review generally observed that on these observations Mexicana and Aeromar codeshared their flight.

In addition to these independent variables, equation (1) is estimated using a number of additional independent variables, controlling for additional factors that can influence airline prices. The literature identifies economies of density and economies of distance as being two important determinants of airline costs. We thus add the inverse of distance in kilometers between the origin and destination city as an independent variable (on the assumption that price is not likely linearly related to distance) as well as the total number of passengers that traveled the route in the previous year for the month in which the data were collected. We added the income of the orign city—2007 GDP per capita measured in thousands of Mexican pesos—as controlling for demand differences among different routes.

Price discrimination is a common pricing strategy utilized by airlines. A tool that airlines frequently use is to distinguish between those customers who book their travel weeks in advance and those who book their travel a short period of time before the departure date. The latter are more likely inelastic demand customers while the former tend to be more price elastic. Thus, in theory, a variable measuring time between the reservation and departure date should affect price. The leisure variable controls for this influence on price and is a dummy variable with a value of one if the time between the reservation and the departure date is greater than two weeks and the reservation has a Saturday night stayover, otherwise the variable is zero.[69] Another variable that attempts to control for potential price discrimination in our model is whether the destination city is considered a tourist attraction. Leisure customers are more likely to fly to tourist destinations and thus more likely to be price elastic.

We estimated four models for equation (1). Model (1) and Model (2) include all the independent variables discussed above, the only difference between the two models is that Model (1) estimates equation (1) as a linear relationship between price and the regressors while Model (2) estimates equation (1) as a log-linear (single-log) relationship. Model (3) and Model (4) drop the independent variables that were not significant in Models 1 and 2. Model (3) is a linear model while Model (4) is a log-linear model. In addition, Models 3 and 4 drop those observations (51 in total) where the total number of passengers

[68] Under the theory of contestability, however, there would not necessarily be a negative relationship between number of competitors on a route and average prices.

[69] Airlines tend to charge business customers a higher price than non-business customers and requiring a Saturday night stayover is a means by which airlines can identify whether the passenger is likely a business customer or not. Business customers are less likely to stayover a Saturday night than are leisure customers.

in the previous year were zero, according to the SCT data.[70] Heteroskedasticity was detected in each of the four models, thus the coefficients standard errors were estimated using the Huber-White-sandwich estimator of the variance.[71] Table 7 presents our results.

TABLE 7
MODELS OF AVERAGE AIRLINE PRICES IN MEXICO, OLS ESTIMATES

	Price (Model 1)	lnPrice (Model 2)	Price (Model 3)	LnPrice (Model 4)
1/Distance	573.66***	147.12***	827.86***	212.28***
pass08	-0.029***	-0.005*	-0.029***	-0.005***
gdpcap07	-0.001	-0.00002	-0.001	-0.0001
Leisure	0.033	0.003		
Touristdest	-0.029	0.003		
Airportsat (Mexico City)	1.33***	0.379***	1.04***	0.329***
Airportcost	0.001	.0006**	0.0006	.0005*
Ncomp	1.41*	0.447**	1.25***	0.410***
ncomp^2	-0.198*	-0.064**	-0.185***	-0.061***
Lcc	-0.849*	-0.345***	-0.685***	-0.295***
Incumbentcomp	-0.889*	-0.236***	-0.610**	-0.173**
Cdshmexmar	1.15***	0.277***	1.41***	0.319***
_cons	-1.33	-0.916**	-.660	-0.784
F-stat	13.20	27.09	19.45	43.34
R-sq	0.481	0.506	0.534	0.545
Rmse	1.572	0.406	1.51	0.398
N	429	429	409	409

*p<.05, **p<.01, ***p<.001

With respect to the main policy variables in this study, lcc and airportsat, the latter being a dummy variable for Mexico City, both are highly significant in each model. Similar to the conclusions with the simple statistical analysis, the existence of low cost carriers on a

[70] These routes represent very low demand routes in the year prior to when the data were collected. In some instances the data did not make sense as they indicated that there were flights flown for the routes in question but no passengers traveled on the route. Average prices on these 51 routes were lower than average prices for all the routes. The Model (3) and Model (4) results are fairly robust to these data exclusions as the results do not change in any material way if we include all the observations to estimate Model (3) and Model (4).

[71] We used the robust option in Stata after the regress command.

route is associated with significantly lower prices, ceteris paribus. Likewise, flying into or out of the Mexico City airport is associated with significantly higher prices, ceteris paribus. The magnitude and percentage impact of the price differences for these two variables is discussed further below.

There are several additional important findings in Table 7. The leisure and touristdest variables did not turn out to be statistically significant at conventional measures of statistical significance. The variables controlling for economies of density and distance (pass08 and distance) are significant and have the hypothesized signs.[72] Increasing the distance by one standard deviation (611 km) is associated with approximately a 6-13% decrease in price. Increasing monthly passengers by one standard deviation (10,550) is associated with approximately a 5-11% decrease in price.[73] Gdp per capita has a small impact on price and is not significant at the 5% level in any the models.

The results for number of competitors, ncomp, require some explanation. In our statistical analysis we observed that the mean airline price increased with the number of competitors until a threshold number of competitors was reached, at which point mean airline prices started to decrease, indicating that perhaps the relationship between airline prices and number of competitors was nonlinear. After estimating equation (1) with just ncomp included in the equation—which turned out to be positive but not significant—we utilized Ramsey's RESET to test the null hypothesis of no misspecification and rejected the null hypothesis. Thus, we included the square of ncomp as an independent variable.[74] The results show that as the number of competitors on a route increases, price increase but they do so at a decreasing rate. The results suggest that, holding constant the number of low cost carriers on a route as well as all other variables, prices increase with the number of competitors until the 5^{th} or 6^{th} competitor is added (depending on the Model in question) at which point prices decrease. The finding that price increase with the number of competitors may be a case of reverse causality where high prices draw more competitors into the market. Further below we assume this variable, as well as lcc and pass08, are endogenous and estimate equation (1) using two-stage least squares.

Finally, there are three additional independent variables that significantly affects price according to the regression analysis. First, when there is competition between Aeromexico and Mexicana on a given route mean prices are lower, holding all other factors constant. The results were significant in each model. Second, when Mexicana and Aeromar code share on a given route, mean prices are higher, holding all other factors constant, with the results being significant in each model. Finally, in two of the models, airport charges were positively and significantly associated with higher average prices.

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[72] Recall the distance variable is the inverse of kilometers for the route in question, thus making interpretation of the point estimates more complex. As distance increases, the inverse of distance decreases. Alternatively, as the inverse of distance increases, distance decreases, thus explaining the positive coefficient on the distance variable.

[73] Based upon percentage change from the mean value of price, 2.87.

[74] We also experimented with interaction effects between the number of competitors and the existence of a low cost carrier. The inclusion of this variable in various models did not alter the conclusions in Table 7.

Table 8 below converts the point estimates for the variables airportsat (Mexico City dummy), lcc, incumbentcomp and cdshmexmar into percentage impact on the dependent variable for each of the 4 models that we estimated.[75] According to Table 8, average prices are between 36 and 46 percent higher in Mexico City. All four models control for airport charges and other important determinants and we thus interpret this result as the cost of high entry barriers and lack of potential competition due to saturation conditions in the Mexico City airport.

TABLE 8
PERCENT IMPACT ON AVERAGE PRICES

	Model 1	**Model 2**	**Model 3**	**Model 4**
Airportsat (Mexico City)	.463***	.461***	.359***	.390***
Lcc	-.296*	-.291***	-.239***	-.255***
Incumbentcomp	-.310*	-.210***	-.212**	-.159**
Cdshmexmar	.401***	.319***	.491***	.376***

*p<.05, **p<.01, ***p<.001

For those routes that contain at least one low cost carrier, average prices are between 24 and 30 percent lower. The estimates are fairly close for all four models. Competition between Aeromexico and Mexicana is associated with average prices that are between 16 and 31 percent lower than when competition is not present between these two airlines. Finally, codesharing between Mexicana and Aeromar is associated with average prices that are between 32 and 49 percent higher than when these airlines do not codeshare.

Instrumental Variable Estimators

Using OLS to estimate the parameter values in equation (1) results in unbiased parameter estimates if certain assumptions hold, otherwise the point estimates are biased. An important assumption is that:

$$E[u|x_1, x_2,\ldots..,x_k] = 0$$

This is known as the zero-conditional-mean assumption and requires that the regressors are contemporaneously uncorrelated with the error term. Whenever the zero-conditional mean assumption holds, the regressors are said to be exogenous and use of OLS linear regression is appropriate. Whenever there is contemporaneous correlation between the error term and the regressosr, however, the regressor is said to be endogenous and the parameter estimates from OLS, β^{OLS}, can no longer be considered unbiased, other estimation procedures can be used to obtain better parameter estimates. Instrumental-

[75] For the linear models—Models (1) and (3)—we divided the point estimates by the mean value of the dependent variable, while for the nonlinear models—Models (2) and (4) the percentage impact was calculated using the formula e^{β}-1.

variables (IV) estimation is one such estimation procedure that provides consistent parameter estimates.[76]

There are at least three independent variables in equation (1) that may be simultaneously determined with the dependent variable price and thus considered endogenous. They are: existence of low cost carrier on a route (lcc), the number of competitors on a route (ncomp), and the number of passengers in 2008 on the route.[77] In order to determine the robustness of our conclusions described above, we use instrumental variables to estimate equation (1) and test whether there is evidence that these regressors are endogenous.

In theory, it is possible that the decision of carries to enter a particular route is based, in part, on the average prices that exist for the route. All else equal, profits on a route are positively correlated with higher prices so we would expect to observe a positive relationship between the existence of carriers on a route and prices.[78] If so, the error term in equation (1) would be part of the error term in an equation estimating the existence of carriers, thus biasing the parameter estimates. To see this for lcc, we rewrite equation (1) as follows:

(2) $$\mathbf{Y_{price}} = \beta_0 + \beta_1 * \text{LCC} + \mathbf{u_{price}}$$

And we write write an equation for low cost carrier as:

(3) $$\mathbf{Y_{Lcc}} = \alpha_0 + \alpha_1 * \text{Price} + \mathbf{u_{Lcc}}$$

Simple algebra shows that the error term $\mathbf{u_{price}}$ is part of equation (3).[79] When the disturbance term $\mathbf{u_{price}}$ is higher—*e.g.,* due to an exogenous shock not captured in any of the other regressors in (2)—not only is the dependent variable $\mathbf{Y_{price}}$ higher but so is the low cost carrier variable. Thus, too much "credit" is given to the low cost carrier variable. The OLS procedure assigns, in error, some of the disturbance-generated variation of price to the low cost carrier regressor with which that disturbance is contemporaneously correlated. If true, then utilizing OLS to estimate β_1 thus results in bias estimates and using IV to estimate equation (1) can minimize the bias.[80]

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[76] Consistency means that as N goes to ∞ the estimates will converge to their respective population parameters. The IV estimator is not an unbiased estimator, however. Moreover, use of IV estimators comes at a cost of having a larger variance-covariance matrix. Because the IV estimator also is biased and has a larger variance than OLS, it is possible that the OLS estimator could be preferred based upon the mean square error criterion. See Peter Kennedy, *A Guide to Econometrics*, Third Edition (1992).

[77] Two other variables, incumbentcomp and cdshmexmar, are strategic decisions of the airlines that are likely based in part on unobserved factors that affect profitability of these routes and may also be correlated with the error term. Thus, treating these variables as exogenous might result in biased parameter estimates for these variables.

[78] Interestingly, using logit to regress LCC on the natural log of prices results in a negative and significant relationship, holding constant distance, gdpcap and number of passengers. Regressing ncomp on the natural log of prices, with and without controls, did not result in significant relationship between prices and ncomp. The same conclusion holds for prices and the number of passengers.

[79] Substitute $\mathbf{Y_{price}}$ in equation (2) into equation (3) and solve for LCC.

[80] It is possible, however, that lcc and ncomp in equation (2) are only weakly endogenous and use of IV may not result in better estimates. The decision by carriers to enter a particular route will likely be influenced, in

The IV procedure produces a consistent estimator in a situation in which a regressor is contemporaneously correlated with the error. In order to use IV to estimate equation (1) we need instruments for our endogenous variables. To derive consistent estimates of (1) we must find an IV that satisfies two properties: the instruments must be highly correlated with the endogenous variable and uncorrelated with **u**. For lcc we use the share of routes at the two endpoint airports that are served by low cost carriers. That is, we count all the routes that are part of the two endpoint airports and determine what percent of those routes have at least one low cost carrier. A regression of lcc on this variable was positive and highly significant. For ncomp we use the number of carriers serving the endpoints. That is, for each endpoint of a route we count up how many carriers are serving that airport and add the two. A regression of ncomp on this variable was positive and highly significant. Finally for pass08 we use the geometric mean of the populations at the endpoints of the routes. A regression of pass08 on this variable was also positive and highly significant.

Table 9 below presents the IV regression results. There are two models, Model (5) and Model (6). In Model (5) we treat lcc, ncomp and pass08 as endogenous while in Model (6) we treat lcc and pass08 as endogenous and treat ncomp as exogenous.[81] As in the case with the OLS estimates, the estimates from the model in Table 9 are efficient for arbitrary heteroskedasticity and are robust standard errors.[82]

The results contained in Table 9 generally confirm the OLS estimates found in Table 7. With respect to the two main policy variables in this study, lcc and airportsat, the IV regressions also find these two variables to be significant. Codesharing between Mexicana and Aeromar is found to be significant consistent with the OLS estimates. The only slight discrepancy between the OLS and IV estimates involves the variable incumbentcomp, whether the two incumbents compete on the same route. The four OLS models found this variable to be negative and significant. The IV estimate in Model (5) finds the variable to be negative but not significant, and this occurs when ncomp is treated as endogenous. As described in footnote 81, however, statistical tests suggested that ncomp should be treated as exogenous which is done in Model (6). In that model, competition between Aeromexico and Mexicana is negative and significant.

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part, by average prices for that route. And, all else equal, higher average prices should lead to greater profits and provide a greater incentive to enter the route. Over time, however, we would expect rents to be competed away and in equilibrium the relationship between prices and low cost carriers may be weak. Unfortunately, we do not have data on how long a low cost carrier has been providing service on the route in question. Moreover, as discussed in footnote 78, the relationship between price and lcc was negative in our data set and non existent for price and ncomp. Moreover, the decision of a carrier to enter a particular route will more likely be influenced by the previous period prices than by current prices. With respect to number of passengers, recall that our variable pass08 measures number of passengers in 2008 not in 2009 when price data were obtained, thus lessen the likelihood that the variables are simultaneously determined.

[81] After estimating Model (5) a Hausman test did not reject the null hypothesis that differences in coefficients were not systematic. A difference in Sargan C test, however, did find support for the existence of endogenous variables. Additional Hausman and difference in Sargan C tests agreed that ncomp was likely exogenous.

[82] We use the ivreg2 command in Stata and the generalized method of moments estimator. Our results do not change in any material way if we assume the presence of *i.i.d*. errors.

TABLE 9
MODEL OF AVERAGE AIRLINE PRICES IN MEXICO, IV ESTIMATES

	Lnprice (Model 5)	**lnprice (Model 6)**
Distance	134.60***	136.23***
pass08	-0.017*	-0.01*
gdpcap07	-0.0002	-0.0001
Airportsat (Mexico City)	0.585***	0.534***
Airportcost	0.0009**	0.0009***
Ncomp	0.107	0.470**
Ncomp^2		-0.055**
Lcc	-0.369*	-0.429**
Incumbentcomp	-0.118	-0.260*
Cdshmexmar	0.311**	0.267**
_cons	-0.975*	-1.254**
F-stat	32.86	33.67
R-sq (centered)	0.4407	0.4479
Rmse	0.4258	0.4231
N	459	459

*p<.05, **p<.01, ***p<.001

Table 10 below compares the percentage impacts from models 2 and 4 of the OLS estimation and models 5 and 6 from the IV estimation, all four models have as the dependent variable natural log of prices. With respect to the airportsat (Mexico City) variable, using IV significantly increases the magnitude of the impact. The OLS estimates results in 39-46 percent higher prices while the IV estimates result in 70-80 percent higher prices. With respect to lcc, the OLS and IV estimates are similar, suggesting an average 30 percent impact on prices. The impact of incumbent competition under the IV estimate—Model (6)—and the OLS estimates is similar, suggesting a 20 percent impact. Finally, the OLS and IV estimates for codesharing between Mexicana and Aeromar are similar as well, suggesting a 33 percent impact on average prices.

TABLE 10
COMPARISON OF PERCENTAGE IMPACT ON AVERAGE PRICES
OLS vs. IV ESTIMATES

	Model 2 OLS	Model 4 OLS	Model 5 IV	Model 6 IV
Airportsat (Mexico City)	.461***	.390***	.795***	.706***
Lcc	-.291***	-.255***	-.309*	-.349**
Incumbentcomp	-.210***	-.159**	-.113	-.229*
Cdshmexmar	.319***	.376***	.365**	.306**

*p<.05, **p<.01, ***p<.001

Consumer Welfare Impacts

The point estimates from the OLS and IV regressions can be used to estimate the impact that policy reforms can have on consumer welfare. With respect to the airportsat variable, since we control for airport prices and other factors in our models, the airportsat variable is measuring the impact that high entry barriers and lack of potential competition is having on airline prices flying into or out of Mexico City. Market-based policy reforms can lower these barriers and increase potential competition, thus affecting average prices. The average price impact of the models listed in Table 10 is approximately 60 percent. Thus, to the extent that sound, market-based policy reforms eliminate saturation conditions in the Mexico City airport, our model predicts airline prices to or from Mexico City would decrease by approximately 60 percent. The average price for routes to or from Mexico City was 3,034 pesos and there were approximately 15.7 million domestic passengers in 2008 that flew on such routes. Using a price elasticity of -1.2 and a linear demand curve (*i.e.*, $Q(p) = a - bP$), a 60 percent price reduction would result in a total of approximately 25 million passengers flying on such routes.[83] And, the change in consumer surplus would be approximately 38.9 billion pesos (approximately 3 billion US$).[84]

We perform similar calculations, using the same assumptions, to estimate the impact on airline prices from policy reforms that eliminate and reduce unnecessary restrictions on the entry and expansion of low cost carriers. According to the OLS and IV estimates, the existence of at least one low cost carrier on a route is associated with prices that are approximately 30 percent lower. Our data show that in 2008 there were approximately 7 million domestic passengers in Mexico that flew on routes where there were no low cost

[83] Using the formula $q_2 = q_1[1-\varepsilon((p_1-p_2)/p_1)]$.

[84] Using the formula change in consumer surplus $= -(p_2-p_1)*(q_1+q_2)/2$.

carriers and the average price on these routes was 3,151 pesos. Under the assumption that policy reforms can increase incentives for low cost carriers to enter to serve one half of these passengers (3.5 million), then a 30 percent price reduction would result in a total of approximately 4.7 million passengers flying on such routes.[85] And the change in consumer surplus would be approximately 3.87 billion pesos (approximately 300 million US$).

[85] Admittedly, policy reforms are not likely to incentivize low cost carries to enter each and every route in Mexico as there were likely be routes where demand is so sparse it could only support a single carrier.