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“Does privatization spur regulation? Evidence from the regulatory reform of European airports”

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Abstract

This paper conducts an empirical analysis of the relationship between privatization and regulation drawing on data from a wide sample of European airports. We find that privatization promotes a shift from basic regulation to a situation of more detailed or non-regulation, depending on the specific characteristics of the privatization process and on the type of airport being privatized. Moreover, we report a significant association between high traffic volumes and more detailed regulation. By contrast, airports where slot allocation is non-coordinated are significantly associated with non-regulation.

JEL classification: L33; L42; L93

Keywords: Privatization; regulation; air transportation; airports

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1. Introduction

Privatization and liberalization in sectors such as transportation, telecommunications and energy have reduced the presence of public firms in these strategic markets. However, such policy reforms do not mean that governments no longer intervene in the decisions of the new private firms, especially when these firms have substantial market power. Indeed, ownership and regulation may constitute alternative forms of government intervention.

This link between privatization and more detailed regulation means that governments can shift their focus from controlling the inputs and processes in the production of public services to controlling the performance of the firms that produce these services. The idea that governments choose between regulation and public ownership when intervening in public services with monopoly characteristics is clear in the contractual approach to government intervention promoted by Gómez-Ibáñez (2003). Contemporary examples of this type of approach can be traced back as far as the privatization policy adopted in 1930s Nazi Germany (Bel, 2010). This process involves a new mode of governance based on the shift from a positive to a regulatory state (Majone, 1997). Hence, public ownership is not the sole alternative available to guarantee public control.

This paper examines the link between privatization and regulation in European airports. The involvement of private investors in the management of airports has increased in recent years. A key factor in this privatization has been government needs to finance huge investments in airport capacity in a context of strong budget constraints.¹ In addition to this, other economic agents involved in the sector have exerted strong pressures; airlines are operating in a very competitive market, and are pushing for additional infrastructure capacity and greater efficiency in airport activities.

Empirical evidence regarding the effects of privatization on the efficiency of airports is scarce and largely inconclusive (Parker, 1999; Oum et al., 2006, 2008; Perelman and Serebrisky, 2010). In this setting, new price regulation frameworks have typically accompanied privatization. Hence, privatization can have an indirect effect on efficiency through associated changes in price regulation. Indeed, the prices charged by the airport operator to airlines for the use of its facilities (runways, terminal buildings, etc.) are usually

¹ Financial pressure was the main rationale underlying airport privatization in the UK (Parker, 1999) and Australia (Tretheway, 2008), the two most extensive privatization programs applied to date.

subject to some type of regulation in order to limit the potential abuse of market power by those airport operators.²

Our main hypothesis is that the shift from public to private ownership leads to significant changes in regulation. In this regard, Albaladejo, Bel and Fageda (2009) have examined case studies of the privatization of Europe's toll motorways, and conclude that privatization is associated with more sophisticated, more formal mechanisms for establishing the level and adjustment of toll charges to road users. Here we extend this analysis of the relationship between privatization and regulation to airports, a transport infrastructure that is experiencing considerable government intervention.

Our primary contribution relies on providing a more formal and empirical test of the dynamic link between privatization and more detailed regulation. Note also that a number of differences are to be found in the analysis of airports compared to that of toll motorways. First, toll motorways can be considered natural monopolies where the opportunities for competition are always very limited. By contrast, the market power of each airport varies according to its specific circumstances. And second, users of toll motorways are atomistic individuals, while users of airports are large firms (airlines) with their own market power. Therefore, airports –unlike network infrastructures– are subject to mixed degrees of competition and monopoly characteristics. And national authorities can hold different views on just how strong this monopoly is and just how reliable competition in the sector is. Thus, the dynamic relationship between privatization and regulation can give rise to different responses.

The structure of this paper is as follows. In the first section, we undertake a review of the literature discussing our main hypothesis. In the second section, we explain the main trends affecting the privatization and regulation of airports in Europe. In the third section, we formulate and estimate an empirical equation that provides a formal test of the link between privatization and more detailed regulation. In the fourth section, we explain the ownership structure and regulation procedures for three countries whose experience we consider relevant for our purposes here. The last section is devoted to our concluding remarks.

² The two main aeronautical charges paid by airline companies are landing fees (i.e., the use the airplanes make of the airfield's installations) and charges for allowing passengers to use terminal building facilities. These two aeronautical charges are the focus of airport price regulation.

2. Literature review

Privatization policies involve a shift in the way governments are able to intervene in markets. Governments change their own form of public control by replacing public ownership with more detailed regulation, in what Majone (1990) called “the rise of the regulatory state”. Indeed, governments can change their forms of intervention and use control mechanisms to achieve their objectives even while relying on private operators and autonomous agencies. This trend has led to a new and emerging mode of governance based on the transition from a positive to a regulatory state (Majone, 1997). In a regulatory state, governments develop more sophisticated and detailed forms of control as public sector activities are subject to restructuring (Hogget, 1996). The regulatory state seeks to rectify market failures, such as the absence of competition, so that detailed regulations for firms with market power rely heavily on performance indicators.

Here we examine this shift from public ownership to detailed regulation in a strategic sector, namely the delivery of transport infrastructures. In the case of airports, privatization gives price regulation a more prominent role since airports generally wield sufficient market power to charge high prices. Hence, the price regulation of airports is required when the airport operators enjoy substantial market power. In those instances where such regulation is needed, it is generally claimed that optimal regulation of airports should meet the following criteria (Oum et al., 2004, 2006, Gillen & Niemeier, 2008):

- i) Independent agencies of the political entities should be responsible for regulation.
- ii) Before prices are finally agreed to, a formal consultation process between airports and airlines is required.
- iii) Price regulation should establish the correct incentives for cost reduction and investment in additional capacity.
- iv) Price regulation should be established on an individual basis because the market power of each airport depends on characteristics such as the volume and type of traffic or the potential competition from other airports (Starkie, 2002; Gillen, 2008, Bel & Fageda, 2010).

Taking these criteria into account, the following methods of airport regulation can be distinguished:

- 1) Basic regulation. Under this scheme, prices are set and adjusted according to costs. However, the eventual prices depend on regulations or administrative rules that fail to make explicit the determinants of either costs or prices. Note that generally airports and

airlines do not enter into a formal consultation process. Furthermore, regulation is never the responsibility of an independent agency.

2) Detailed regulation. Under this scheme, a formal mechanism establishes the assets that are to be regulated. In addition, prices are set and adjusted each year according to a mathematical formula, which considers performance indicators that might include costs, revenues, evolution in traffic volume and depreciation rates. In some instances, regulation is accompanied by a formal consultation process between airports and airlines. However, regulation is not usually the responsibility of an independent agency.

Among the mechanisms applied in detailed regulation, we should distinguish between price-cap and rate-of-return regulations. The latter are based on the principle that prices must be set high enough so as to generate revenues that cover total costs, including the depreciation of capital as well as a sufficient profit rate. Hence, rate-of-return regulation limits the profits of the airport operator on the basis of its historical costs. By contrast, price-cap regulation allows airport operators to increase prices in line with the consumer price index less a factor X .

Several studies have examined the relative advantages and disadvantages of price-cap and rate-of-return mechanisms. Gillen and Niemeier (2008) provide an extensive review of these studies and suggest that price-caps provide better incentives for reducing costs and investing in capacity since they constitute a forward-looking mechanism. Indeed, rate-of-return regulation implies that price setting depends fundamentally on a firm's past costs. Further, price-cap regulation considers potential efficiency improvements made by the regulated firm. However, in practice, price-caps usually consider the past costs of the regulated firm also so that any differences between price-caps and rate-of-return regulation may be modest (Starkie, 2004).

Note that several authors have claimed that price regulation may not be necessary if it is clear that the airport operator's ability to set high charges is only modest. First, the airlines also wield market power that can counter that of the airport manager (Brueckner, 2002). Second, the threat of re-regulation can in itself constitute an element of dissuasion, as illustrated by the case of Australia (Forsyth, 2008). Finally, the airport operators can receive incentives to charge lower prices so as to attract more traffic, since the more passengers they attract, the higher the volume of revenue generated by the commercial activities offered in the airport terminal (Starkie, 2001). However, congested airports may have more opportunities to wield their market power, and some kind of regulation might therefore be necessary (Basso, 2008). In a similar vein, Fu et al. (2006) forward arguments

in favor of a certain degree of regulation since airport charges can have a marked impact on the competition between airlines. Indeed, low-cost airlines are more severely affected by high prices than network airlines. Finally, Oum et al. (2004) provide a further argument in favor of regulation: their empirical analysis shows that price-cap regulation is a more adequate mechanism than deregulation because of the incentives it provides for setting prices, and making investments and cost reductions

However, it should be stressed that deregulation does not mean that governments fully relinquish the monitoring of airport activities. Airports remain subject to the threat of re-regulation and the ex-post control exerted by the competition policy authorities. Furthermore, any differences between unregulated public airports and airports subject to basic regulation are in practice not substantial. Indeed, prices are set directly by the firm that manages the unregulated airport, but this may mean a significant difference with basic regulation should the firm be controlled fully or partially by private investors.

3. Privatization and regulation of airports in Europe

In this section, we examine major trends in the ownership and regulation of airports in Europe. In particular, we apply our analysis to those European airports that generate a high volume of traffic. Our sample comprises the hundred airports in the European Union, Switzerland and Norway with most passenger traffic in 2007. Table A1 in the appendix lists the airports used in this empirical analysis. Among the hundred airports included in our sample, 17 are located in the United Kingdom, 16 in Spain, 14 in Italy, 11 in Germany, eight in France, and four each in Norway and Greece. The remaining countries account for three or fewer airports in our sample.

Table 1 shows the airport operators in the sample that have been fully or partially privatized. The privatization of the British Airport Authority (BAA) in 1987 was the first such experience in Europe. At the time of its privatization, the firm was managing three airports in the London area (Heathrow, Gatwick and Stansted), three airports in Scotland (Aberdeen, Edinburgh, Glasgow) and Southampton. Since the early nineties, many other airport operators have been privatized in the UK. In fact, Manchester airport is currently the only large British airport to be fully controlled by a public firm. Note that airport privatization in the United Kingdom has generally been more prevalent than in the rest of Europe, and it has been of a different nature. Private investors in the UK have taken on the management of British airports, and at the same time they have purchased the airport

infrastructure and land (with few exceptions, prominent among which is Luton Airport). Thus, airport privatization in the UK typically involves the transfer of assets to private investors. By contrast, in continental Europe, airport privatization typically means that private investors gain control of the firm managing the airport through a long-term concession or a management contract, but the government retains ownership of the infrastructure and land. Hence, in continental Europe privatization is usually implemented through the contracting out of airport management.

It is clear, therefore, that the airport privatization program has been particularly ambitious in the UK, involving full privatization in most cases. However, several large airports have also been privatized in Italy and Germany. The privatization of Venice airport took place at the same time as that of the BAA. In the middle of the nineties, the operators at Fiumicino and Ciampino in Rome and at the airport in Naples were sold to private investors. More recently, the airports of Pisa, Torino and Bologna have been fully or partially privatized. In Germany, private investors are shareholders of three of the country's largest airports - Frankfurt, Dusseldorf and Hamburg - and a number of others including Hanover and Hahn (the latter, however, has recently been returned to public control). Finally, several airports in Europe's capital cities have been fully or partially privatized since the mid-nineties. These include Charles de Gaulle and Orly in Paris, Athens, Copenhagen, Vienna, Athens, and Budapest. In a similar vein, the operator of the airport in Zurich was privatized in 2000.

When private investors are not key shareholders in the firm managing the airport, regional or local governments are typically in charge of individual airports. However, there are a number of exceptions to this pattern - for example, the central government manages the airports of Amsterdam, Dublin and Prague. In each case, though, there were plans to privatize, but they have yet to be implemented. In addition, a number of central governments manage airports as a single national system. This is the case of Spain, Portugal, Finland, Norway and Romania (and to a lesser extent, Sweden as well). All these countries, with the exception of Spain, are characterized by the heavy concentration of air traffic in the capital city.

Insert Table 1 about here

Table 2 shows the main characteristics of the regulation process of airports in Europe. As mentioned above, it is generally believed that regulation should be implemented by an independent agency; however, in practice, regulation has been introduced by a central

government agency in most European countries. The main exception is Germany where regional governments are responsible for regulation. Independent regulation has only been adopted in the United Kingdom, the Netherlands, Ireland and Austria.

Price-caps are applied in several airports in the United Kingdom (Heathrow, Gatwick, and Stansted) and in other large airports including Dublin, Stockholm-Arlanda, Vienna, Budapest, Frankfurt, Dusseldorf, Hamburg and Copenhagen. Rate-of-return regulation is applied in Amsterdam, Brussels, and in those German airports where price-caps have not been introduced.

Note that airports in the United Kingdom and Ireland are not subject to regulation, with the exception of those mentioned above. Airports in Switzerland, Poland, and the airports of Gothenburg, Prague, Bucharest and Riga are not subject to price regulation either. Among these non-regulated airports, only a number of UK airports and Zurich are controlled fully or partially by private firms.

Basic regulation is applied at all other airports, which includes all the airports in Spain, Italy, Norway, Greece, Portugal, France (except Paris), and the airports of Helsinki and Sofia. Recall that there do not seem to be any major differences between non-regulated public airports and those subject to basic regulation. Prices are set directly by the firm that manages the airport in the case of non-regulation, a situation that only differs from that of a basic regulation scenario when the firm is controlled fully or partially by private investors.

Insert Table 2 about here

At this juncture, it should be pointed out that Directive 2009/12/EC of the European Parliament and the Council of 11 March 2009 on airport charges may lead to major changes in the regulation procedures of European countries. This directive has to be incorporated within corresponding national legislations before 15 March 2011 and is applicable to all airports in the European Union handling more than five million passengers each year, as well as to each country's main airport should it handle fewer than five million passengers. The directive establishes that the entity managing the airport should be independent and that a formal consultation process should be initiated between airlines and airports before charges are finally approved. However, each country is to maintain considerable powers of discretion as regards the specific mechanism regulating the behavior of the airport operator.³

³ Furthermore, as stated in article four of the Directive, those countries whose airports are managed in an integrated way - as a centralized single system, can opt out from the obligation of establishing airport prices based on the costs of each individual airport.

4. An empirical analysis of the relationship between the privatization and regulation of airports

As discussed above, privatization places greater importance on assessing the regulation mechanisms implemented at each airport. It is our claim that this regulation tends to follow more formal procedures when airports are managed by private investors. Indeed, airport policy reforms (especially privatization) generally lead to more detailed regulation methods, such as price-caps or even de-regulation (when it is clear that the corresponding airport wields no market power).

Table 3 classifies the various airports in our sample in terms of the degree of involvement of private investors in their management. Among the 100 airports in the sample, 26 are fully controlled by private firms, 11 are partially controlled by private firms and the rest are controlled by public administrations at different territorial levels. Table 3 highlights the existence of substantial differences between public and private airports.

Insert Table 3 about here

The average volume of traffic handled by fully private airports is higher than that at public airports, while the prices charged by the former are markedly higher.⁴ In the case of partially privatized airports, the mean volume of traffic is notably higher than in the other sub-groups of the sample, while prices are similar to those charged by fully privatized airports. Here, Bel and Fageda (2010) show by multivariate econometric analysis that the prices set by private, non-regulated airports are higher than those set by public airports or regulated private airports. Note that this does not necessarily mean that private airports are more inefficient than the other airports in the sense that they fail to provide the correct incentives for cost reduction and investment. It may well be the case that private non-regulated airports enjoy a certain degree of market power, but it might also be the case that prices at public airports (especially when subject to basic regulation) are artificially low.

Table 3 also illustrates the relationship between the form of ownership and the regulation mechanism. Basic regulation becomes less common as the weight of private ownership in the firm managing the airport increases. Price-cap regulation (or rate-of-

⁴ As outlined above, the two main aeronautical charges paid by airline companies are landing fees for the use the airplanes make of the airfield's installations, and charges for the use the passengers make of the terminal building. Our price data include the different rates that airports charge the airlines based on information provided by *airportcharges.com* for 2008. The prices used have been fixed with reference to an A-320 aircraft with an occupancy factor of 70% (105 passengers). The price is for the whole A-320 but we can argue that we are dealing with rates per passenger since a constant occupancy factor is assumed. Our price data include the following charges: landing fees, rights to approach and park aircraft, charges for using the terminal, noise and safety surcharges (where applicable).

return regulation) is not common in public airports, while a significant proportion of (fully or partially) private airports are subject to some form of detailed regulation. In the case of public airports, basic regulation is clearly the dominant form.

Note that the proportion of non-regulated airports is also significant in the case of those that have been fully privatized. In our sample, all the airports that are fully controlled by private firms and which are not subject to regulation are located in the UK. As we shall see below and in greater detail, airports in the UK are only regulated when it is clear that they might enjoy a degree of market power. In continental Europe, only Zurich airport is not subject to regulation and this is partially controlled by private firms. All the other non-regulated airports in continental Europe are managed by a public firm.

In short, public ownership seems to be associated most frequently with basic regulation, whereas private ownership is most frequently associated with detailed regulation. In addition, some public airports are not subject to regulation in continental Europe while some private airports (which may not enjoy any market power) are not subject to regulation in the UK.

We can provide a more formal test of the relationship between privatization and regulation at Europe's airports by estimating the following equation for airport a :

$$Regulation-form_a = \alpha + \beta_1 Private_a + \beta_2 Total_Traffic_a + \beta_3 \%National_Traffic_a + \beta_4 Slots + \varepsilon \quad (1),$$

where the dependent variable, *Regulation-form*, is a discrete variable that takes the value zero in the case of non-regulated airports, it takes the value one in the case of airports subject to basic regulation (which is our reference case), and finally it takes the value two in the case of airports subject to detailed regulation. Recall that our sample of routes is based on the 100 largest airports in the European Union (EU-27), Norway and Switzerland. As we outlined above, by basic regulation we refer to a scheme in which prices are fixed by law or administrative regulations that do not make explicit the determinants of either costs or prices. Furthermore, by detailed regulation we refer to a scheme in which a formal mechanism establishes the assets that are regulated, and in which prices are set and adjusted each year according to a mathematical formula that considers such aspects as costs, revenues, evolution in traffic volume and depreciation rates. Recall also that prices are set directly by the firm (public or private) that manages the airport in case of non-regulation. The explanatory variables included in equation (1) are the following:

1) The percentage of private property owned by the management company, *Private*. This variable allows us to test the main hypothesis in our analysis, namely that public

ownership and detailed regulation are alternative forms of government intervention in markets. Hence, the greater the weight of private investors in the firm managing the airport, the lower is the probability of the airport being subject to basic regulation. In this context, private airport operators are more likely to be subject to detailed than to basic regulation. Given the large proportion of fully private airports in the UK in our sample, we can also expect that private airports are more likely to be subject to non-regulation than to basic regulation

2) The airport's total volume of traffic, *Total_Traffic*. Price regulation at airports with a higher volume of traffic is generally more complex. Note also that large airports may enjoy substantial market power. Thus, we expect that the higher the amount of traffic handled by an airport, the higher the probability that the airport will be subject to detailed regulation.

3) Domestic traffic as a percentage of the airport's total traffic, *%National_Traffic*. Airport policies may be designed to favor national passengers, so airport charges may be conditioned by non-explicit and detailed criteria when the proportion of domestic traffic is high.⁵ Hence, as the weight of domestic traffic at the airport increases, the probability of the airport being subject to basic regulation is expected to rise.

4) As regards procedures for allocating slots to airlines to use runways at the corresponding airport, we include a discrete variable that can take the following values. It takes the value zero for non-coordinated airports, the value one for schedule-supervised airports and the value two for coordinated airports. The International Air Transport Association (IATA) classifies airports according to the degree of excess demand when establishing procedures for slot allocation. Thus, a distinction is drawn between: (1) non-coordinated airports where there is no excess demand and the allocation of slots is at the discretion of the airport operator; (2) airports where flight schedules have to be supervised; and (3) coordinated airports where excess demand requires the application of standard procedures for slot allocation ('grandfather rights', 'use-it or lose-it', criteria for new slots and new entrants, etc). This provides an approximate idea of the congestion levels at the airports, and also provides an indicator of the use of administrative rules for the allocation of slots. Indeed, coordinated airports clearly use administrative rules in allocating slots to airlines. Given that basic regulation also implies an administrative rather than solely economic approach to airport regulation, we can expect a positive relationship between the

⁵ Bel and Fageda (2009) find evidence of airport investment policies that include cross subsidies from international users to domestic users.

likelihood of using basic regulation and administrative rules for coordinating airports. Note also that non-coordinated airports must be uncongested airports, so regulation may not be so necessary at these airports.

Table 4 shows the results of the estimation of equation (1). Given the discrete nature of the dependent variable, the estimation is made using the multinomial logit technique. As it is constructed our discrete dependent variable, the reference case is basic regulation.

The common factors that might affect airports within the same country should be borne in mind. Therefore, the estimation takes into account the possible correlation between the standard errors of airports that belong to the same country by considering clusters for each country. Additionally, the standard errors are corrected for a possible problem of heteroskedasticity derived from a non-constant variance between very different observations.

Insert Table 4 about here

The overall explanatory power of the model is quite high. The results from the estimation confirm our main predictions. Most significantly, detailed regulation is more likely than basic regulation when private firms manage airports. Indeed, the variable of private ownership takes a positive value when considering the move from basic to detailed regulation. As expected, basic regulation is also less common than non-regulation, but this is probably only the case in the UK and not on continental Europe. Thus, the private ownership variable takes a positive value when we consider the move from basic regulation to non-regulation.

We believe that the very different nature of privatization in the UK and continental Europe might explain why privatization presents a significant association with either non-regulation or more detailed regulation. Privatization in the UK usually involves the full transfer of asset ownership (along with airport management services). Greater reliance on competition by the British authorities might explain why most private airports are not subject to regulation (as is also the case in Australia), whereas only the three largest airports – Heathrow, Gatwick and Stansted - are subject to (more detailed) regulation. Unlike the situation in the UK, privatization in continental Europe usually involves the contracting out of airport management through the partial or full privatization of the airport operator, whereas asset ownership is retained by the respective government. Because of their nature,

concessions are subject to more detailed regulation than public management, which would explain the move from basic regulation to more detailed regulation with privatization.

The remaining variables present the expected sign and are, in the main, statistically significant. Interestingly, large traffic volumes appear significantly associated with more detailed regulation. By contrast, airports where slot allocation is not coordinated appear to be significantly associated with non-regulation. Finally, as expected too, those airports with a greater weight of domestic traffic appear to be more closely associated with basic regulation.

5. The relationship between privatization and regulation – three case studies.

Below, we examine how regulation is implemented in the three largest (in terms of their volume of traffic) European air markets: the United Kingdom, Germany and Spain. Table 5 provides a good overview of the airport data in our sample for these three countries.

The variation in airport prices is high in the UK and Germany. This suggests that differences in airport market conditions might be more marked in these countries, a feature which is captured, albeit somewhat approximately, by the variations in traffic (see Table 5). By contrast, in Spain, the very small variation in prices between airports is not consistent with the heterogeneity that exists between these airports. However, airport prices in Spain are relatively low. Note that airports in United Kingdom and Germany are managed on an individual basis (with each airport being managed separately, with few exceptions), while their counterparts in Spain are managed on a centralized basis: all airports being managed by the same government-owned firm.

Most airports in the United Kingdom face potential competition from other nearby airports. By contrast, none of the Spanish airports faces competition owing to their centralized management, while few airports in Germany face any potential competition from other airports. Finally, none of the airports in the UK is subject to excess demand, in the sense that none of them is coordinated in terms of airline slot allocation. By contrast, all airports in Spain are coordinated airports, while Germany once again finds itself in an intermediate position, having both coordinated and non-coordinated airports. Thus, slots in Spain are always allocated in accordance with administrative rules, but this is not necessarily the case in the airports of the UK and Germany.

Insert Table 5 about here

Below, we explain how regulation has been implemented in the UK, Germany and Spain. Note that the intensity of the privatization process has varied markedly in these countries. Hence, our analysis of the regulation of airport prices in each of these countries should provide further insights into the relationship between privatization and regulation.

a. United Kingdom

The Airports Act of 1986 determines the ownership structure and regulation of airports in the United Kingdom. The seven airports managed by the British Airport Authority (BAA) have been privatized and a number of public firms, subject to private regulations, have been established as airport operators at the other large airports (Graham, 2008). Since 1990, many other airport authorities, traditionally owned by regional and/or local governments, have been privatized; today government-owned firms are only responsible for the airports of Manchester, East Midlands, and a few smaller airports.

The Airports Act of 1986 also conferred greater responsibilities and autonomy on the Civil Aviation Authority (CAA), an entity independent of the Ministry of Transport, which has responsibility for regulation. In turn, the Airports Act also authorized the Ministry of Transport to designate the airports that were to be subject to regulation. Thus, a formal procedure was established for designating airports for regulation, and the Ministry of Transport had to specify the criteria used in reaching this decision.

In addition, the Competition Authority was given an important role in advising and monitoring the CAA. This institutional structure has given rise to various conflicts between the Competition Authority and the CAA, to the extent that the regulating entity does not always fulfill the criteria as laid down by the Competition Authority in its reports.

In 1986, four airports - Heathrow, Gatwick, Stansted, and Manchester – came under regulation on the grounds that they enjoyed substantial market power. The process of price-capping ensured that annual price increases in the future would be limited to the Consumer Price Index less a factor X that comes under review every five years. During the five-year regulation period, the airport operator can profit from efficiency improvements without having to reduce prices. The CAA establishes the price-increase limits during the period of regulation after consulting with the Competition Authority and the airlines. This consultation process between airports and airlines is more formal in the cases of Heathrow and Gatwick.

Factor X is set to guarantee a minimum level of profitability consistent with the cost of capital. This profitability is calculated on the basis of predictions of the following elements (Starkie, 2004): 1) Air traffic at the airport; 2) Total revenues; 3) Operating expenses, taking into account potential efficiency improvements; 4) Investment plans for the following years. The latter two elements are used to determine the regulated asset base.

Since 2003, a specific price-cap formula has been established for each airport so as to avoid the distortions caused by cross-subsidies between BAA airports.⁶ Note also that the airport of Manchester has not been subject to regulation since 2008. All the other airports operate in a de-regulated environment, although they are constantly under the threat of regulation. In fact, the Airports Act provides that the CAA should take measures against non-regulated airports if they engage in any anti-competitive practices such as unreasonable discrimination between users, the charging of artificially low prices in relation to neighboring airports or the use of their market power against airlines operating at their sites. Thus, the Competition Authority may identify and recommend sanctions for such practices, although the final decision lies with the CAA.

However, the joint ownership of the seven airports of the BAA – which concentrate about 60% of UK traffic - has come under increasing criticism and the Competition Authority has recently obliged Ferrovial (the owner of BAA since 2006) to sell the airports of Gatwick (already sold), Stansted, and one of the two largest Scottish airports (either Glasgow or Edinburgh) over which it has had control. According to the Competition Authority (2008), the idea behind breaking up the BAA is to promote competition between airports that have, to date, been managed by a sole firm.

b. Germany

In general, the owners of the firms responsible for managing German airports have been either the federal, regional or local governments, in variable proportions. Since 1990 the main driver behind the change in the ownership structure of Germany's airports has been the disinvestments made by the federal government in a context of increasing financial constraints. Thus, several airports have been partially privatized in recent years, including large airports such as Frankfurt, Dusseldorf and Hamburg, and smaller airports including Monchengladbach, Hahn, Hanover and Saarbrücken.

⁶ Starkie (2004) documents the distortion in competition between Stansted and Luton due to the cross-subsidies between Stansted and Heathrow that the regulation system in place prior to 2003 had permitted.

No legal framework operates to condition the price regulation of airports in Germany (Müller, König and Müller, 2008), while there are just two federal laws establishing that the prices charged by airports should be approved by the corresponding regulatory agency. Contrary to the rest of Europe, regional governments (rather than the federal government) are responsible for regulating airport prices. Thus, there is a potential conflict of interests with the regional governments acting as both regulator and airport manager.

The absence of a common legal framework means there is a broad diversity of regulatory regimes in Germany. Thus, some regional regulatory agencies have implemented rate-of-return regulation while others have implemented price-cap regulation. In both cases, a formal consultation process between airlines and airports is conducted before charges are finally approved. In the case of airports subject to rate-of-return regulation, the regulatory agency takes into account the following elements when establishing the level of profitability allowed for the regulated assets: revenues and costs recorded in the previous years, future forecasts as regards costs and investments and compensation for inflation.

Most airports in Germany are subject to the rate-of-return regulation. However, some partially privatized airports, including Dusseldorf, Frankfurt, Hamburg and Hanover, have entered into private contracts with the airlines operating out of them in order to set prices.⁷ These contracts, which require the approval of the regional regulatory agency, have been established for a period of four or five years, and involve the adjustment of prices on an annual basis according to a formula in which price increases are limited by the Consumer Price Index less a factor X. To compute this factor X, both parties to the contract take into account past and future costs and revenues. Often these contracts provide for the implementation of revenue sharing agreements between airports and airlines so that price increases are dependent upon the evolution in traffic volume (Niemeier, 2002; Gillen and Niemeier, 2008; Müller, König and Müller, 2008). Thus, both parties to the contract establish a sliding scale whereby they agree to share the risk of unexpected variations in airport traffic.

c. Spain

Aeropuertos Españoles y Navegación Aérea (AENA) is a public firm, dependent on the Ministry of Transport, which manages on a centralized basis more than forty commercial airports in Spain. It is also the owner of all the facilities available at these airports. AENA

⁷ Since 2007, Frankfurt airport has reverted to the earlier system of rate-of-return regulation.

and the Ministry of Transport take all the relevant decisions regarding airports, including investments, prices and slot allocations.

The prices charged by the Spanish airports to the airlines are, therefore, proposed by AENA, but the final decision rests with the Spanish Parliament. In theory, airport charges are based on the total costs of all airports managed by AENA. However, in practice these charges are approved by Parliament, so they are adjusted annually in line with charges for other public services. Hence, it would be inaccurate to claim that the prices charged are established according to the total costs of the airports. Indeed, the charges are insufficient to meet airports costs, and AENA has recorded financial losses since 2007, making it the airport operator reporting the largest deficit in the world.

In Spain, the Civil Aviation Authority, a dependent body of the Ministry of Transport, is responsible for setting the goals of national airport policy. However, the authority does not play any role in the setting of prices. Finally, there is no consultation process between airports and airlines for the fixing of airport charges.

d. Summary and discussion

The price regulation analysis of the three countries considered reveals major differences. In Spain, both ownership and price regulation are the responsibility of the Ministry of Transport. The lack of private investors in the firm that manages all of Spain's airports may explain why a formal price regulation mechanism has yet to be implemented. Prices are low in comparison to those set in other countries, which suggests a consultation process between airports and airlines has not been deemed necessary. However, competition between airports is not possible, slots are allocated through administrative rules, and the evolution of prices is not associated to the evolution in costs. In fact, the financial situation of the Spanish airports has worsened dramatically in recent years.

By contrast, private ownership is fairly prevalent in the United Kingdom where price regulation – at least, in the three airports where it is practiced - is based on a detailed mechanism. There are two independent authorities, the CAA and the Competition Authority, which are responsible for the regulation of airport prices. A formal procedure is established to designate airports as regulated airports. In this regard, most airports are not regulated but some anti-competitive practices are provided for by law and may lead to the intervention of the CAA. Prices for regulated airports are subject to a price-cap formula, whereby price increases are limited by a factor X that includes several performance

indicators. In this regard, there is a consultation process between airlines and airports before prices are finally approved. Finally, it should be noted that competition between airports in the United Kingdom is possible and airport operators have flexibility in allocating slots.

In Germany, the main particularity lies in the crucial role that regional governments play as owners (in many cases) and as regulators of airports. However, several airports have been partially privatized in recent years. As for regulation, some airports apply the rate-of-return regulation and others (especially those that have been privatized) apply price caps. However, there always exists a formal consultation process between the airport and the airlines before prices are finally approved (in fact, price caps are based on contracts between these two parties) and the price adjustment is dependent upon performance indicators.

To sum up, our analysis of these three cases shows that the privatization of airports in Europe seems to be accompanied by a shift towards the introduction of new regulation schemes. In Spain, full public management is associated with basic regulation. In Germany, partial privatization has been implemented through concessions, while detailed regulation mechanisms take into account the interests of the various agents (airports, airlines, and the regulation agency) involved in the setting of prices. Finally, privatization in the United Kingdom has led in general to the transfer of asset ownership and the implementation of price caps at those airports that seem to enjoy market power. All in all, we can conclude that ownership and regulation are alternative mechanisms open to governments for influencing prices, but this would seem to be particularly true in those cases in which the market power of firms is perceived as substantial.

6. Concluding remarks

Our analysis contributes to the literature by undertaking an empirical study of the dynamic link between privatization and regulation. To the best of our knowledge, this is the first study providing econometric evidence for the use of privatization and regulation as potential substitutes for government intervention. Our analysis provides evidence that detailed regulation is a more likely alternative than basic regulation when private firms manage airports. Indeed, the private ownership variable acquires a positive value when the shift from basic to detailed regulation is considered. As expected, basic regulation is also less common than non-regulation in private airports, but this is probably only the case in

the United Kingdom, where greater reliance on competition could explain why most private airports are not subject to regulation.

We also found evidence to suggest that potential market power is associated with more detailed regulation. Thus, the largest airports have a higher probability of being subject to more detailed regulation. By contrast, those airports where slot allocation is not coordinated - indicative of their facing fewer congestion problems - have a higher probability of being subject to non-regulation.

Private sector participation seems set to increase over the next few years, given the pressure exercised by other agents on airport activity. Indeed, the airlines operate today in a highly competitive environment, and demand sufficient capacity from the airports at which they carry out most of their operations. And, often, governments face the need to finance significant investments in airports at a time of major budgetary restrictions. Privatization grants greater importance to regulation to the extent that private managers might have greater incentives than public managers to set high prices. Our analysis suggests that this is particularly true under certain circumstances, which include the airports' potential to generate traffic, and the use of concession contracts to privatize airport operators. Instead, full privatization -involving transfer of asset ownership- might result in non-regulation for those airports where market power does not appear to be a potential problem.

Unlike other transportation infrastructures, such as motorways or railways, airports present mixed degrees of competition and monopoly characteristics. Thus, different responses might exist to the dynamic relationship between privatization and regulation. In addition to this, national policies might have different perspectives on how reliable competition is in the sector. The effects of these different national points of view and traditions of government intervention can greatly influence the dynamic relationship between privatization and regulation. Further research should be undertaken to shed more light on this issue.

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TABLES

Table 1. Privatization of main airports in Europe

Airport	% Private ownership	Year (s) of first sale to private investors
London-Heathrow (LHR)	100	1987
London-Gatwick (LGW)	100	1987
London-Stansted (STN)	100	1987
Edimburg (EDI)	100	1987
Glasgow (GLA)	100	1987
Aberdeen (ABZ)	100	1987
Venice (VCE)	71	1987
Liverpool (LPL)	76	1990
Glasgow-Prestwick (PIK)	100	1992
Vienna (VIE)	60	1992-1995-2001
Copenhagen (CPH)	60.8	1994-1996-2000
Belfast (BFS)	100	1994
London city (LCY)	100	1995
Birmingham (BHX)	51	1997
Bristol (BRS)	100	1997
Naples (NAP)	70	1997
Hahn (HHN)	65	1997
Rome-Fiumicino (FCO)	95.75	1997-2001
Rome-Ciampino (CIA)	95.75	1997-2001
London-Luton (LTN)	100	1998
Dusseldorf (DUS)	50	1998
Hannover (HAJ)	30	1998
Zurich (ZRH)	42	2000
Hamburg (HAM)	49	2000
Torino (TRN)	44.29	2000
Frankfurt (FRA)	29	2001
Athens (ATH)	45	2001
Newcastle (NCL)	49	2001
Malta (MLA)	80	2002-2005
Brussels (BRU)	62.1	2005
Budapest (BUD)	75	2005
Larnaca (LCA)	100	2005
Pisa (PSA)	78	2005
Paris-Charles de Gaulle (CDG)	32.5	2006
Paris-Orly (ORY)	32.5	2006
Bolonia (BLQ)	13.90	2007
Leeds (LBA)	100	2007

Note: We do not account for further changes in the identity of private investors after the first sale.
 Source: Gillen and Niemeier (2008), Graham (2006) and web sites of the corresponding airports.

Table 2. Method of regulation in European airports

Country	Airports	Regulation-method
United Kingdom	Heathrow, Gatwick, Stansted, Manchester	Price-caps
	Rest of airports	No regulation
Spain	All airports	Basic Regulation
Italy	All airports	Basic Regulation
Germany	Dusseldorf, Frankfurt, Hamburg, Hannover	Price-caps
	Rest of airports	Rate of return
France	Charles de Gaulle, Orly	Price-caps
	Rest of airports	Basic Regulation
Norway	All airports	Basic Regulation
Greece	All airports	Basic Regulation
Ireland	Dublin	Price-caps
	Shannon, Cork	No regulation
Switzerland	All airports	No regulation
Portugal	All airports	Basic Regulation
Poland	All airports	No regulation
Sweden	Stockholm-Arlanda	Price-caps
	Goteborg	No regulation
Belgium	All airports	Rate of return
The Netherlands	Amsterdam	Rate of return
Other countries	Copenhagen, Malta	Price-caps
Other countries	Vienna, Budapest	Price-caps
Other countries	Helsinki, Sofia	Basic Regulation
Other countries	Prague, Bucharest, Riga, Larnaca	No regulation

Source: Oum et al (2004), Gillen & Niemeier (2008), IATA (2007), Cunha & Brochado (2008), and the corresponding civil aviation authorities.

Table 3. Data about airports according to the type of ownership of the managing firm

Managing firm	Total number airports	Mean traffic (10³ passengers)	Mean prices	% Airports with no regulation	% Airports with basic regulation	% Airports with detailed regulation
Mostly private	26	12821	2455	50%	15%	35%
Partially private	11	19598	2380	18%	36%	46%
Public	63	9776	1866	17%	67%	16%

Source: Eurostat, Airportcharges.com, Oum et al (2004), Gillen & Niemeier (2008), Graham (2006), IATA (2007), Cunha y Brochado (2008) and the corresponding civil aviation authorities.

Table 4. Estimates of the equation for regulatory reform (multinomial logit)

Explanatory variable: Regulatory form	From basic regulation to no regulation
Private	0.033 (0.0101)***
Total_Traffic	0.00002 (0.00004)
%National_Traffic	-5.28 (1.64)***
Slots	-1.64 (0.46)***
Intercept	3.46 (1.19)***
Explanatory variable: Regulatory form	From basic regulation to detailed regulation
Private	0.020 (0.010)**
Total_Traffic	0.000086 (0.000037)**
%National_Traffic	-5.06 (1.64)***
Slots	-0.58 (0.46)
Intercept	0.67 (1.26)
N	100
Pseudo-R ²	0.37
χ^2 (Joint. Significance)	51.24***

Note 1: Standard errors in parenthesis (robust to heteroskedasticity and adjusted for correlation between airports of a same country)

Note 2: Statistical significance at 1% (***), 5% (**), 10% (*)

Table 5. Data about prices, traffic and competition in sample airports

Country	Total airports	Mean traffic (variation coef.)	Mean Prices (variation coef.)	Number of airports with at least other nearby airport with a different manager	Number of airports with excess of demand
Total	100	11648 (1.11)	2076 (0.37)	39	60
United Kingdom	17	13312 (1.26)	2821 (0.31)	15	4
Spain	16	11798 (1.13)	1451 (0.02)	0	16
Germany	11	15791 (0.97)	2110 (0.29)	3	6

Note: Data on traffic is in thousands of passengers, while data on prices is in Euros.

Source: Airportcharges.com and Eurostat

Annex

Table A1. Sample of airports used in the empirical analysis

Airport	Airport	Airport
Aberdeen (ABZ)	Helsinki (HEL)	Stuttgart (STR)
Alicante (ALC)	Heraklion (HER)	Tegel (TXL)
Arlanda (ARN)	Ibiza (IBZ)	Tenerife North (TFN)
Amsterdam (AMS)	Lanzarote (ACE)	Tenerife South (TFS)
Athens (ATH)	Larnaca (LCA)	Thessalonica (SKG)
Basel (BSL)	Leeds (LBA)	Toulouse (TLS)
Barcelona (BCN)	Linate (LIN)	Trondheim (TRD)
Belfast (BFS)	Lisboa (LIS)	Turin (TRN)
Bergamo (BGY)	London-Heathrow (LHR)	Valencia (VLQ)
Bergen (BGO)	London City (LCY)	Warsaw (WAW)
Bilbao (BIO)	Liverpool (LPL)	Venice (VCE)
Birmingham (BHX)	Luton (LTN)	Verona (VRN)
Bologna (BLQ)	Lyon (LYS)	Vienna (VIE)
Budapest (BUD)	Madrid (MAD)	Zurich (ZRH)
Bucharest (OTP)	Málaga (AGP)	
Bordeaux (BOD)	Malta (MLA)	
Bristol (BRS)	Milan-Malpensa (MXP)	
Brussels (BRU)	Manchester (MAN)	
Cagliari (CAG)	Marsella (MRS)	
Catania (CTA)	Menorca (MAH)	
Krakow (KRK)	Munich (MUC)	
Copenhague (CPH)	Nantes (NTE)	
Köln-Bonn (CGN)	Naples (NAP)	
Cork (ORK)	Newcastle (NCL)	
Charleroi (CRL)	Nice (NCE)	
Ciampino (CIA)	Nuremberg (NUE)	
Dublin (DUB)	Oslo (OSL)	
Dusseldorf (DUS)	Palma de Mallorca (PMI)	
East Midlands (EMA)	Palermo (PMO)	
Edimburgh (EDI)	Paris-Charles de Gaulle (CDG)	
Faro (FAO)	Paris-Orly (ORY)	
Fiumicino (FCO)	Porto (OPO)	
Fuerteventura (FUE)	Praga (PRG)	
Frankfurt (FRA)	Pisa (PSA)	
Gatwick (LGW)	Prestwick (PIK)	
Gran Canaria (LPA)	Rhodes (RHO)	
Glasgow (GLA)	Riga (RIX)	
Girona (GRO)	Schonefeld (SFX)	
Ginebra (GVA)	Seville (SVQ)	
Gothaborg (GOT)	Shannon (SNN)	
Hahn (HNN)	Sofia (SOF)	
Hamburg (HAM)	Stansted (STN)	
Hannover (HAJ)	Stavanger (SVG)	

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