Vertical relationships at airports: impact on retail sales and rent revenue to an airport*

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Abstract

In this paper we discuss vertical relationships between airports and retailers in terms of their potential pro- and anti-competitive effects. To distinguish those effects, we look at the impact of vertical relationships (captured under concession management approaches) on retail sales and rent revenues to an airport at US American airports during 2004-2008. In our analysis we estimate sales and rent revenue equations for food&beverage, specialty retail and news&gifts retail areas. According to our preliminary results, we find that as compared to the direct operation of retail concessions by an airport, a private developer, a management company, or multiple prime operators (that appear to foster retail competition) lead to higher consumer consumption (approximated by retail sales per passenger). These approaches may also benefit a retailer (since it gets higher retail sales). A combination of different concession management approaches ("hybrid structure") appear to be less productive than the direct operation of concessions by an airport. While leasing the retail space to multiple prime operators, the aiport appears to get more rent revenue than in case of direct operation. The other effects have been found to be statistically insignificant.

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1 Introduction

The strategic effects of vertical relationships and their impact on consumer welfare have long been a source of debate in economics and antitrust. Vertical integration may be used to facilitate foreclosure. This may lead to higher prices and harm consumer welfare. On the other hand, vertical integration may have efficiency-improving effects, that may lower prices, improve product quality and, thus, increase consumer welfare. In practice both types of effects are present. Therefore, the assessment of the welfare effects of vertical integration foresees weighting the relative importance of various effects. Integrated firms may engage in foreclosure, but they also can eliminate successive monopoly markups, internalize the choice of product mix and lower transaction costs.

This paper examines vertical relationships between airports and retailers to determine their welfare effects. The airports have developed different concession management approaches and contractual relationships to administer their retailer activities[1]. The airport authorities may choose either to manage the retail business themselves, i.e., "vertical integration", or outsource the management of retail activities to a third party (for example, a private developer), i.e., "vertical separation".[2] These are two extremes. In between there are several concession management approaches where the airports play a lesser or larger role in managing the retail business.

Given the decreasing revenues from aeronautical activities, the airport authorities around the world are interested in maximizing their retail revenues. On the other hand, consumer well-being and customer satisfaction are important in generating sufficient demand for airport purchases (especially, in case of frequent travellers) that could generate higher current and future retail sales. Different types of vertical relationships may have different implications for airport, retailer and consumer welfare.

The focus of this paper is on understanding airport-retailer relationships that administer airport retailing (their underlying governance structures) and investigating their pro-competitive and anti-competitive effects. This issue has not been investigated either conceptually or empirically for the airports. Freathy and O'Connell (1999) and Kim and Shin (2001) describe different approaches to the management of airport concessions.

For general overviews of empirical studies on retail contracting and the effects of vertical restraints, see for example, Lafontaine and Slade (1997), Lafontaine and Slade (2008). Lafontaine and Slade (1997) summarize studies that aim to determine the circumstances under which parties reach various sorts of restrictive agreements to a contract as well as determinants of retail-organizational form[3]. Lafontaine and Slade (2008) review existing empirical

[1]Retailing is usually defined as the sales of goods or services to individual passengers, meeters&greeters, farewellers and the working community at the airport (Moodie International, 2007). It includes duty free, specialty retail, news&gifts, food&beverage, currency exchange, travel agencies, facility&infrastructure services such as lockers, trolleys and pay phones or commercial services such as car parking, car rental or advertising.

[2]It should be noted that we do not observe classical "vertical intergration" and "vertical separation" in case of airport retailing.

[3]The authors point out several major results from the empirical studies on retail contracting: 1) There is a positive relationship between risk and the use of high-powered incentives (vertical separation). 2) There is a positive link between the importance of the agent's effort in production and the use of high-powered incentives. 3) Larger units are likely to be company-operated. 4) High costs of monitoring output or sales

studies on vertical restraints and argue that most studies find support for the existence of efficiency gains. Those empirical studies focus on the effects of vertical restraints on consumer well being (for example, price, consumption) and firm value (for example, profits). Cooper et al. (2004) review a number of empirical studies and find that vertical practices have significant pro-competitive effects. Vertical integration/vertical restraints often can help solve double markup problems and/or reduce costs in other ways. Some studies show evidence that could be consistent with "dealer services" efficiencies. Finally, the findings of some studies were consistent with both pro- and anticompetitive effects. Davis and Garces (2010) describe various incentives for vertical control: transaction costs and contractual incompleteness, double marginalization and other vertical externalities (e.g., vertical service externalities), horizontal externalities (e.g., free-riding on investments by other retailers) and softening of competition and foreclosure.

Studies related to shopping malls may indicate some factors that affect their retail performance, which may also be relevant for the airport retailing. E.g., Brückner (1993) argues that the sales volume of a particular store will depend on the amount of space it occupies as one of inputs. Benjamin et al. (1992) show that stores with higher sales per square foot pay low shopping centre rents. Gould et al. (2005) argue that "stores that generate the most externalities by their presence and effort should pay lower rents and have larger incentives to exert effort". Ater (2009) is perhaps the only study related to shopping malls that studies vertical restraints.

Our ultimate goal is to assess different vertical contractual relationships in terms of their implications for producer (airport and retailer) and consumer welfare. To achieve our aim, we investigate the impact of vertical relationships on overall retail sales and rent revenues to the airport[4]. If pro-competitive effects (e.g., efficiency gains) of a certain concession management approach prevail, that should result in a higher retail revenue per passenger (as a proxy for higher customer consumption and higher consumer well being. In this case we attribute the increased retail sales to increased quantity effects rather than the increased prices, or if increased prices than due to higher quality of products or service)). Simultaneously, this may also bring higher revenues to the airports (in case of variable percentage fees to the airports). Higher retail sales per square foot may rather measure the retail performance or the productivity of retail operators or outlets. Higher rent to the airport may be evidence for the higher bargaining power of the airports. The retail yield (measured as the ratio of airport retail income to gross retail sales) measures that amount of income that the airport receives

are positively related to company operation. 5) High costs of monitoring effort directly are negatively related to company operation. 6) Retail prices are lower under company operation than under franchising.

[4]The investigation of factors that drive the airports' retail revenues has become a focus of several empirical papers (see, e.g., Appold and Kasarda, 2006, van Dender, 2007, Volkova and Müller, 2010). In particular, passenger volumes and mix (such as e.g., business vs leisure travellers, domestic vs international passengers) as well as dwell time are found to be important determinants of those revenues (e.g., Kim and Shin, 2001, Appold and Kasadra, 2006, Castillo-Manzano, 2009, Graham, ...). In addition, such factors as amount of retail floor space per passenger, the location of retail floor space, and the retail mix can explain the retail performance (e.g., Kim and Shin, 2001, Arthur D. Little, ..., Moodie International, 2007). Freathy and O'Connell (1998) argue that legislative and political directives as well as socio-economic changes are important determinants of airport retailing. Furthermore, external shocks such as for example terrorist attacks as of 11 September 2001 or Severe Acute Respiratory Syndrome (SARS) and other either natural disaster or conflict related events can impact the stream of airport revenues.

from its retail concessions, and, thus, be a proxy for a total rent paid (fixed and variable percentages) under different concession management approaches. It may indicate the ability of an airport to successfully negotiate concession agreements with retailers. Generally, it is difficult to disentangle all those effects in practice.

According to our preliminary results, we find that as compared to the direct operation of retail concessions by an airport, a private developer, a management company, or multiple prime operators (that appear to foster retail competition) lead to higher consumer consumption (approximated by retail sales per passenger). These approaches may also benefit a retailer (since it gets higher retail sales). A combination of different concession management approaches ("hybrid structure") appear to be less productive than the direct operation of concessions by an airport. While leasing the retail space to multiple prime operators, the aiport appears to get more rent revenue than in case of direct operation. The other effects have been found to be statistically insignificant.

The remainder of the paper is structured as follows. First, we describe airport retailing and discuss vertical contractual relationships. Subsequently, we derive the empirical model specifications and describe the data. After that, we present our empirical findings. We conclude the paper with a discussion of our results and policy implications.

2 Vertical contractual relationships of airport retailing

2.1 Overview of effects

In general an airport authority faces a decision whether to manage the retail business (concessions) itself (i.e., "vertical integration"), or to contract it out, e.g., (i.e., "vertical separation"). If it chooses the latter alternative, the airport has several options to manage its concessions while contracting a third party to manage the retailing such as e.g., sign a management contract, hire a private developer, engage prime or multiple retail operators.

Running of retail business under different management structures may have diverse effects. First of all, there may be efficiency gains if airport retailing is managed by a large retailer, e.g., due to the economies of scale that could lead to lower prices. Among the potential positive effects of airport-retailer relationships one should point out high-quality customer service and product quality as well as product variety and choice. Certain approaches may encourage more investment into e.g., shop concepts (for certain brands, they are however quite standardized under all approaches, e.g., Hugo Boss), offer renewal (introduction of new brands, including local ones), a dynamic and wide-ranging portfolio, new merchandising techniques and concept innovation than other approaches. Airport operators may increase outlet density to encourage downstream competition.

On the other hand, the efficiency gains of a large retailer presence should be contrasted against possible market power effects that could lead to higher prices. Global operators may be reluctant to undertake risk to increase turnover by introducing new brands or new concepts that could bring them lower margins.[5] They may have more market power than local operators. Retailers may be interested in margin maximization by stocking only the most profitable product categories, which may lead to limited product choice for consumers.

[5] This point has in particular been mentioned in Arthur D. Little (...).

Concession management approaches may differ in to what extent they discourage competition between retailers or outlets. There will be limited competition if an airport is dominated by a few major concessionaires. In general, tenders for airport concessions may have different designs.

The approaches may also differ as for whether they encourage the entry of local brands that may increase the product variety and choice and bring more competition. It should be mentioned that brand name and image may play a large role by airport customers. Entry into retailing may be costly because of e.g. presence of economies of scale or scarcity of good locations.

Furthermore, the complicated structure of vertical relationships may mean the compilation of several fees that at the end may lead to "double marginalization", and, thus, finally result in higher prices to consumers. The use of a third party to manage retail business may mean higher transation costs. Under the direct operation the airport has to bear larger operating costs and higher risk.

There are several concession management approaches. Below we discuss those management structures that we observe in our data in more detail. A complete ARN dataset that we use in our econometric analysis as well as descriptive statistics are described in Section 5.

2.2 A closer look at concession management approaches

2.2.1 A prime operator

A single retail operator or more than one operators may get a contract for a particular retail category or categories (e.g., food&beverage, specialty retail, news&gifts). In case a single concessionaire develops and operates a substantial portion of the space, it is called "master concessionaire" (Kim and Shin, 2001). The master concessionaire agreements sometimes cover all of the terminal concessions (i.e., all food, beverage and retail units at the airport). It may subcontract some of its spaces.

The master concessionaire funds the capital improvements. He also makes the minimum guarantee or percentage of gross sales payments for the entire leased area to the Airport (these both payments are passed through to subtenants) (Herring, 2002).

This management structure produces fewer choices for the passenger. The master concessionaire can charge a premium price for goods and services (Knight, 2009).

The master concessionaires currently offer branded retail at street prices. However, they still can make money from operating profit, "leasing the space from the airport on relatively long-term leases, plus paying a concession fee to the airport" (Herring, 2002). Under this model a firm can make bids for example on the provision of themed restaurants through an airport. A concessionaire with relevant expertise in food&breakfast retail area could pick up several differently branded locations under one contract. He does not have to pick up the bar contract for example as well. Such a segmentation of contracts alleviates another downside of the model, namely the double optimization of profit that occurs while subletting. In case a concessionare does not have the necessary expertise, the concessionaire sublets the space, adding their own profit margin to the profit margin offered to the airport. The net effect is thus higher rent to the tenant, which will lead to higher prices. In this situation

concessionaires are rewarded by maximizing operating profit that is not the same as the goal of the airport after having signed the long-term contract. The developer model tries to address those interests more closely.

The airport can benefit from the know-how of the master concessionaires what concerns their sales, merchandising and marketing. Based on their survey, Kim and Shin (2001) find that the master-concessionaire approach is the most appropriate method of managing airport concessions.

Based on the ARN data, Cleverland Hopkins international aorport and Spokane international airport appear to use a prime operator in their retailing business.

In terms of discussion of different pro- and anti-competitive effects, this concession management approach may mean fewer choices for the passenger, premium higher prices for goods and services, and double optimization of profit that occurs while subletting.

2.2.2 Multiple prime operators

Under "multiple prime operators" management approach, commercial space is leased to several retail operators, or concessionaires. For example, many airports have a prime operator for food&beverage, and a different prime operator for retail. The prime concessionaires are obliged to develop, finance and manage concession facilities. Rental fees in form of fixed or stepped percentage rates from gross sales or square based rate are paid to the airport. With this structure there is a risk of lower lease income and high administrative costs related to the management of multiple lease agreements (Kim and Shin, 2001).

Under this concession management approach, the airport operator plays a strategic rather than operational role in stimulating retail activities (Freathy and O'Connell, 1999[6]). The contracted by the airport authorities third parties are responsible for the sale of goods, store layout and operations. Their contracts are negotiated periodically[7]. The airport operators have the role of landlords and are responsible for the physical facilities of the building and the provision of the contracted service requirements (e.g., heat, light). The airport operator is not involved in the purchase or sale of product, however, it may be committed to marketing the airport as a whole. In case of concessionaires, there is a relatively low financial risk to the operator. The main financial risk of the operator is "the opportunity cost of running a poorly performing outlet and any consequent knock-out effect this may have upon sales in other outlets". It is relatively easy to administer concessions.

The airport operators can exert a different degree of control over the product market. Some airports, for example Schiphol, has a strict non-competitive policy between concessionaires. The airport authority agrees and regulates the merchandise that can be sold in each outlet. If each of two competing retailers has won a tender to sell the same product in different parts of the terminal, in such a case both must follow a policy of non-price competition. The airport operator is, however, unable to directly influence the actual choice of the merchandise. Retailers may, thus, be interested in maximizing their margins rather than

[6]The discussion of "multiple prime operators" management approach below is largely based on Freathy and O'Connell (1999).

[7]The duration of each concessionaire agreement and its financial conditions will vary by airport and retailer. It is uncommon to review the rents over the duration of the contract. The length of the contract depends in the first turn upon the level of investment required from a retailer.

sales turnover by stocking only the most profitable product categories. The concessionaire formula provides little incentives for high levels of sales based performance. On the other hand, other airports follow a different approach and actively encourage competition between retailers by providing greater choice to the consumer and reducing the critique of them exploiting a monopoly position. Such a policy is e.g., pursued by the BAA which views each of the airport terminals in which they operate as separate markets and encourage a strategy of direct competition among all concessionaires. This can help improve standards as well as keep prices under control. This will, however, undermine the operator's revenues.

In the US, many airports use such a concession management approach, e.g., Ted Stevens Archorage International Airport.

In terms of pro- and anti-competitive effects, this approach may mean more competition than "a prime operator". There might be competition both at the retail operator level and at the outlet level. Outlets of different retail operators are more likely to compete with each other ("interbrand competition") than outlets of the same retail operator ("intrabrand competition").

2.2.3 Private developer

A commercial developer[8] designs and develops the concession facilities similar to traditional shopping malls. It finances and administers all phases of concession operation (it develops, builds and manages all the concessions) and subleases spaces to qualified retailers (it controls the occupancy of retail space within the airport) in return for fees paid by the airport. Developers do not operate any of the concession spaces. Under this governance structure nationally recognized operators can offer streamlined management and administration combined with primary responsibility and unified capital development of facilities. On the other hand, the airport does not have direct control over concession operators (Kim and Shin, 2001).

The developer models aims to provide travelers with the optimal retail mix through offering a combination of high-quality national and international brands and high-quality regional/local brands (Knight, 2009).

There are certain advantages of the private developer model as compared for example to the concessionaire model (Herring, 2002). In case of the latter model, the concessionaire passes on the retail income. If there is a long period of no or minimal profit, the manager can renege on their contract with the airport. Or the airport itself may want to renege and negotiate with the manager when times are not good and profits are low. Thus, both sides of the relationship under the concessionaire model "are exposed to the risks of the other trying to change the relationship midstream". The developer model is more suited to uncertain environments if both parties are aware of the risks and there is a fair compensation.

A number of US American aiports use a "private developer" approach, e.g., Indianapolis international airport, Baltimore/Washington International Thurgood Marshall airport This approach may mean higher customer satisfaction, higher gross sales and wide variery of individual concepts than "a prime operator" or "multiple prime operators" approaches. This approach may imply stronger competition at the retailer level. The developer fees may,

[8]The developer model was pioneered by BAA USA in 1992 at Pittsburgh International Airport.

however, reduce the revenue to the airport, and may imply some kind of "double marginalization" effect. This approach may also involve higher transaction costs and contractual incompleteness for the airport than other approaches. S

2.2.4 Management company

Under fee management contract (or management company) the airport authority hires one or more management companies to operate concessions (Kim and Shin, 2001). The management company gets from the airport authority the monthly fees and a percentage of the net operation incomes obtained from the concession operation. The airport authority is responsible for financing, providing space, capital improvement, facility design, development and updates, developing operation standards, keeping inventory, tenant relationship and financial accounting of profitability.

The management company should provide competent management of the service whereas the airport essentially retains ownership of the concession and contracts (Hoerter, 2001). The airport usually has control over strategic issues (e.g., space, pricing, product offering, total service hours) whereas the operator can decide about actual operation (employee scheduling, product display, etc.). The third party makes no investment in infrastructure. All financial risks and award primarily accrue to the airport. The airport has to have expert in-house staff.

As compared to concession retailing, management contracts require a higher degree of commitment and partnership between the two parties (Freathy and O'Connell, 1999). Management contract model is chosen when an airport operator does not have the necessary retail skills or experience. In this case an existing retail group may become responsible for retailing at the airport and get a predetermined set of fees in return as the remuneration. There is a variety of ways in which management contracts can operate. For example, a full cost recovery basis foresees that "the operator costs are met in full and a management fee is provided that is linked to a pre-determined level of sales". Both parties agree a sales and profit budget. Incentives arrangements are built in to encourage the contractor to exceed the financial objectives set.

In some cases the airport operator may become to a certain extent involved into retail operations under management contracts. For example, the BAA (UK) changed its duty free operation from a concession system to a management contract. BAA started to purchase all stock, retain all sales revenues from duty and tax free operations and be responsible for the upkeep of the outlets. Its management partner Allders became responsible for the operation of the stores. In return for that, Allders got a number of graduated management fees that were linked to specified levels of sales turnover. A joint board of BAA and retail executives administered merchandise selection and pricing.

A management contract allows the airport operator to exercise greater control over the total product offer whereas retailers get necessary incentives to maximise sales rather than margins. There is also no incentive to concentrate upon a limited product range. Therefore, the airport may develop a wide and balanced merchandise mix.

In our US data sample only a couple of airports use the "management company" approach, e.g., Ronald Reagan Washington international airport. This approach may mean a wide and balanced merchandise mix but may be less competition because of fewer operators?

2.2.5 Airport directly

There may be several management structures with various degree of airport participation: wholly-owned subsidiary, direct operation, direct lease, joint venture (Kim and Shin, 2001).

Airport may directly operate commercial outlets, known as "direct operation" (Kim and Shin, 2001). It is usually observed when commercial activities require limited commercial skills or they require a level of investment that retail operators are not willing to undertake. The airport's staff may have, however, an insufficient commercial knowledge. This model allows airports to completely control the offer and concepts and directly deal with brands and operate shops itself by bypassing operators. It may allow the airports maintain competitive prices as there are no "turnover fees squeezing margins" (Arthur D Little, ...). In this case the risk associated is greater than with a concessionaire strategy (Freathy and O'Connell, 1998). On the other hand, all income accrued goes directly to the airport operator. It gives the airport the potential to capture all the surplus profit (Hoerter, 2001). However, "the airport authority has a significant set of financial outlays, not only in merchandise and sales staff but also for fixtures, fittings, warehousing and specialist personnel (buyers, merchandisers space planners, etc.)" (Freathy and O'Connell, 1998).

The airport operator is directly responsible for the purchase of product from suppliers (Freathy and O'Connell, 1999). Product is delivered to the airport warehouse. The airport operator is responsible for all merchandising, marketing and stock control. The airport may still use concessions. They do not, however, represent the primary method of retail development and can be viewed as a supplement to the portfolio of goods and services on offer. Concessionaires will offer the product range in those areas where a high degree of expertise or product knowledge is needed (e.g., floristry or fresh goods retailing).

Under direct leasing the airport leases out each concession space individually to separate vendors. The concessionaire has to develop, finance and manage concession facilities, whereas the airport usually collects rental fees. The airport retains control of individual concessions. However, it hat to bear the risk of lower lease income and high administrative costs arelated to managing multiple lease agreements (Kim and Shin, 2001).

An airport may set up a wholly-owned sunsidiary, a separate corporate identity. This will allow hire more experienced staff and managers (Kim and Shin, 2001). The airport operator may also set up a joint venture with a third party. In this case, the airport authority will have less freedom to manage concessionaires.

A number of US American airports prefer to operate their retail business directly, e.g., Hartsfield-Jackson Atlanta International Airport. This approach may ensure competitive prices, no double marginalization fee and lower transaction costs than under other approaches. Sufficient independent operators would result in competitive pricing.

2.2.6 Hybrids

A hybrid approach can include any combination of the options above. There is a number of US airports that use a "hybrid structure" approach. E.g., Miami international airport uses several approaches to run its retail business: direct leasing, primes and developer.

This approch may imply strong competition between retailers and greater product variety for consumers.

2.3 Research hypotheses

The above described vertical contractual relationships of airport retailing differ in the degree to which an airport authority becomes directly involved in operating various concessions available at an airport. This may have different effects on retail sales, and rent revenue to the airport. This might help derive some implications concerning potential pro-competitive and anti-competitive effects of different vertical contractual relationships and see which vertical relationships can be most welfare-enhancing. Since we do not have any information on prices, it is difficult to derive net welfare effects. Therefore, we try to infer some conclusions based on the data available on retail sales and rent revenue to the airport.

In terms of retail sales: The retail sales equations are estimated to quantify the effects of vertical relationships on the retail performance at airports. Retail sales per square foot can be interpreted as some measure of productivity whereas retail sales per passenger could measure shopping activity. Higher shopping activity could be welfare-enhancing both from the producer and consumer point of view as retail sales could be a measure of consumer well-being and a measure of firm value. Sales are usually higher in welfare-enhancing models of vertical contracts. Vertically integrated companies may sell more than their unintegrated competitors in the same market.

More efficient producers will tend to vertically integrate. Their lower costs will drive down average market prices directly because they have lower costs and can charge lower prices and indirectly because they will reduce their competitors' optimal prices in equilibrium. Welfare-enhancing models should be characterized by higher productivity. As it has been mentioned in Hortascu and Syverson (2007), higher productivity producers are more likely to vertically integrate, they are also larger and are more likely to charge lower prices. Thus, based on this argument, airport managed retail structure should have higher productivity and be welfare-enhancing.

In terms of rent revenue:

Typically the concessionaire pays a fixed rental plus additional income to the airport once a predetermined profit or turnover level has been reached by the concessionaire. Some agreements, usually those derived by the airport to encourage the increased retail presence, are entirely based on the profit/turnover of the concession. Higher rent to the airport may be evidence for the higher bargaining power of the airports in talks with third parties and retail operators.

In terms of retail yield: This perfomance indicator might measure the ability of an airport to successfully negotiate competitive concession agreements with prospective retailers.

3 Empirical model specification

3.1 Empirical model

In this paper we estimate several empirical models to study the effects of vertical contractual relationships at airports on retail sales, and rent revenues to the airport.

We estimate the following revenue&rent empirical model (at airport level):

$$Y_{it} = \beta_0 + \beta_1 \sum_{j=1}^{m-1} M_{it} + \beta_2 X_{it} + \varepsilon_{it} \tag{1}$$

where Y_{it} is a dependent variable (either retail sales, or rent revenue to the airport), $\sum_{j=1}^{m-1} M_{it}$ is a set of dummy variables for a concession management approach, X_{it} are exogenous airports characteristics (e.g., size of the airport, passenger mix, dwell time), ϵ_{it} is iid, i stands for airport (or terminal if terminal-level data are used), t stands for a time period and m is the number of concession management approaches at airports.

3.2 Estimation techniques

First we estimate pooled regressions accounting for time-fixed effects. The introduction of time-fixed effects may allow us capture some unobservable characteristics that vary over time (e.g., changes in airport regulation, or macroeconomic environment). Unfortunately, we cannot introduce airport-fixed effects directly (using a fixed-effects estimator) because of a low number of observations. A large number of dummy variables will consume a lot of degrees of freedom and lead to inconsistent estimates. Therefore in addition to the pooled model with time-fixed effects, we estimate a between-effects model. The between-effects model is based on the calculation of means for each airport. To use this model, it is important to have many airports in a sample. The random-effects model is based on taking a weighted average of the fixed and between estimates.

It should be noted that our data panel is unbalanced, which is especially important to take into account for the consistent descriptive comparison across years but which is unproblematic for econometric estimations.

The identification of the effects of different vertical contractual relationships comes from cross-section variation across airports. Only a couple of US airports have changed their concession management approach during the period under consideration. However, one should take into account the potential endogeneity problem of vertical structures. For example, in the price equation the use of a vertical restraint could be endogenous to the relationship between price on the one hand and supply, demand and policy variables on the other hand. If there are no legal restrictions, the upstream firm will choose a restraint that maximizes its profits. And there are many unobservable factors that could affect both retail price and the choice of the restraint. Usually it is difficult to find instruments that are correlated with the use of the restraint but do not impact the dependent variable. The endogeneity problem can be, however, less acute in panel data estimations.[9]

Model fit and diagnostic statistics: autocorrelation, heteroscedasticity, normality of residuals, structural stability, functional form, test for omitted variables, influential cases

Discussion of possible measurement errors in the data

[9] For more discussion on the endogeneity problem in the context of vertical restraints, see e.g., Lafontaine and Slade (2008).

4 Data collection and description

4.1 Data collection and sources

Our data come from the ARN Fact Books[10] for 2004-2008 for the US American airports. This dataset contains the information on retail sales and rent revenue to the airport (across duty free, food&beverage, specialty retail, news&gifts, passenger services and advertising), traffic structure, and square footages on a terminal-by-terminal basis[11].

The annual Fact Book is a comprehensive resource with details on concession programs in about 80 airports per year[12] and key concession companies in the airport retailing industry. It contains information on key airport retailers, service providers, consultants, developers, managers, etc. In addition, the ARN Fact Books contain the information on the names of existing tenants (listing of store names and company operators), square footage of each location, and the lease expirations (some information is however missing).

We have been checking the data for consistency and cleaning for any mistakes (e.g., misprints). The most comprehensive dataset is available at the terminal level. At the airport level the data is more restricted. In order to work at the airport level, one needs to aggregate the data from the terminal level to the airport level.

The ARN Fact Books contain the information on management structures at airports such as: prime operator, managed by airport directly, hybrid structure, management company, multiple prime operators, and private developer. In addition, in the dataset there were the following structures: asset manager (in 2004), fee manager (in 2005 and 2007) and terminal operator (in 2008). "Asset manager" and "fee manager" were aggregated with "management company". We have dropped the terminal operator from the current analysis. We could see that several airports have changed their management structure over time (about 30 airports during 2004-2008). This, however, appears not quite plausible. First, those persons who fill out the ARN questionnaire may use their subjective definition of concession management approaches. Second, there may be different people each year, who fill out the questionnaire. Therefore, we looked through the management structures once again and re-classified those based on additional information on the company names and management contacts available in the ARN database.

In addition, the data on population and average incomes per capita for US regions, where the airports are located, have been collected from .....

4.2 Descriptive statistics

In our paper we focus on food and beverage (F&B), specialty retail and news&gifts. We leave duty-free out from our econometric analysis as usually it is the single concessionaire who operates the duty-free business. In addition, duty-free sales are insignificant in the

[10]The ARN Fact Books are published by the Armbrust Aviation Group (AAG), an international aviation publishing and consulting company established since 1992.

[11]It should be noted that not all airports reported their information on a terminal-by-terminal basis. In those cases, the airports reported the same information on an airport-wide basis.

[12]The number of airports varies across years.

Percentage of the aiports in our sample in the total sample of US airports.

US American airports. We also leave out foreign exchange and other general services, the determinants of which may be more specific than we can infer from our data and for which the concession management approach may not matter.

We use the data for 2004-2008 for descriptive statistics analysis and econometric estimations at airport level[13]. On average, we observe 75 airports per year. About half of airports in out sample use either "airport directly" or "multiple prime operators" approaches (see Table 1).

Table 1. Types of management structures at US Americal airports: number of airports, 2004-2008

	2004	2005	2006	2007	2008
A prime operator	8	8	8	14	5
Airport directly	21	22	23	23	29
Hybrid structure	15	15	15	15	14
Management company	2	2	2	2	4
Multiple prime operators	21	22	24	22	28
Private developer(s)	6	6	6	6	7
Total	73	75	78	82	88

Source: own estimations based on ARN Fact Books for various years

The decision to use a particular concession management approach may depend on the size of the airport. Often it is the lack of airport experience in retail business combined with the size of the airport that e.g., make the airport contract a third party to run a retail business. Table 2 gives the frequency of vertical structures for different sizes of airports in our data sample. As we can see, "prime operator" vertical structure is often used by small airports. The direct management of the retail business by the airport is used extensively by all sizes of airports. In the sample of small and medium-sized airports, the most popular management structure is "multiple prime operators", followed by "airport directly". Large airports use "hybrid structure" followed by "airport directly".

Table 2. Frequency of management structures at US American Airports for different sizes of airports: number of airports, 2004-2008

Management structure	All years, small	All years, medium	All years, large
A prime operator	18	15	9
Airport directly	35	43	40
Hybrid structure		11	64
Management company	1	6	4
Multiple prime operators	49	63	5
Private developer(s)		11	20
Total	103	149	142

Source: own estimations based on ARN Fact Books for various years

As we can see from Table 3 below, the highest total sales per passenger is for "private developer" and "hybrid"/"management company" vertical structures, whereas the highest total sales per square foot are for "hybrid", followed by "private developer", "management

[13]The data at the terminal level should be still checked for consistency and cleaned for any mistakes. The advantage of the data at the terminal level is that it contains the information on the passenger mix. In addition, it may allow the use of airport-level fixed effects in our estimations.

company" and "airport directly" vertical structures. The lowest total sales per passenger is by "prime operator", and the lowest total sales per square foot is for "multiple prime operators".

Total rent to the airport per passenger is the highest under "multiple prime operators" vertical structure followed by "hybrid" and "management company" vertical structures. Total rent to the airport per square foot is the highest for "hybrid structure" followed by "management company" and "airport directly" structures.

The highest retail yield is by "multiple prime operators" and the lowest by "private developer". The rest of structures perform pretty similarly. Therefore, we decided not to perform econometric analysis with retail yield as a dependent variable.

Table 3. Retail sales, rent revenues and retail yields for various management structures at US American airports: means, across 2004-2008

	All	PrimOp	AirDir	Hybrid	ManCo	MultPrOp	PrivDev
ep (m)	8411.5	4269	9779.2	16824.9	5878.0	3059.2	10768.4
total sales/ep	6.71	5.66	6.34	7.55	7.37	6.34	8.72
f&b sales/ep	3.95	3.63	3.82	4.54	4.18	3.62	4.72
spec ret sales/ep	1.31	0.91	1.12	1.48	1.67	0.99	2.38
news sales/ep	1.81	1.81	1.57	1.63	1.50	2.12	1.88
total sales/sf	793.01	718.04	846.29	1095.04	872.14	599.34	876.50
f&b sales/sf	806.64	648.02	842.00	1140.48	975.17	597.31	913.70
spec ret sales/sf	830.01	836.30	814.10	1076.38	753.47	718.87	804.70
news sales/sf	1130.57	993.41	1160.22	1518.70	1480.21	877.58	1160.86
total rent/ep	1.04	0.84	0.90	1.13	1.16	1.37	0.80
f&b rent/ep	0.58	0.49	0.46	0.56	0.58	0.84	0.40
spec ret rent/ep	0.08	0.05	0.09	0.09	0.14	0.08	0.03
news rent/ep	0.13	0.15	0.12	0.12	0.15	0.15	0.06
total rent/sf	106.82	106.27	118.04	139.54	123.74	87.02	87.29
f&b rent/sf	103.82	90.48	104.41	120.26	117.99	115.46	78.21
spec ret rent/sf	120.88	115.67	186.71	109.49	104.36	100.98	29.93
news rent/sf	141.76	176.96	166.87	168.65	200.54	116.49	61.31
total retail yield	0.16	0.14	0.15	0.14	0.16	0.21	0.09
f&b retail yield	0.13	0.13	0.13	0.13	0.14	0.12	0.13
spec retail yield	0.14	0.15	0.14	0.15	0.14	0.15	0.12
news retail yield	0.85	0.15	0.15		0.18	0.15	0.15

Source: own estimations based on ARN Fact Books for various years (ACRP data)

Note: there may be a different number of observations for different variables (due to data restrictions)

Note: "PrimOp" stand for "prime operator", "AirDir" for "airport directly", "Hybrid" for "hybrid structure", "ManCo" for "management company", "MultPrOp" for "multiple prime operators", and "PrivDev" for "private developer"

5 Empirical findings

In this Chapter we present the results from our econometric estimations. We do estimations separately for different retail areas as the importance of different sales drivers may vary across different retail areas. In addition, we would like to see whether the choice of a concession management approach matters across retail areas. This may be relevant for airport business managers.

5.1 Revenue model

In this section we present our results of estimating the revenue model at airport level: for retail sales per passenger and retail sales per square foot.

5.1.1 Retal sales per passenger

First we present our results for the model specification with retail sales per passenger as a dependent variable.

All retail revenues together In the pooled regression with time fixed effects (see Table 4 below), among the management structures dummies, the dummies for "management company", "multiple prime operators" and "private developer" have got a positive sign and are statistically significant. These vertical structures generate more retail revenue per passenger as compared to the "airport directly" approach. The dummy for "private developer" remains statistically significant under the between-effects estimator.

Table 4. Revenue model: All retail revenues together (retail revenue per passenger (log))

	Fixed time effects		Between-effects	
	Coeff	St.dev.	Coeff	St.dev.
a prime operator	-0.04	0.04	-0.09	0.07
hybrid structure	0.02	0.03	0.01	0.06
management company	0.13***	0.07	0.12	0.13
multiple prime operators	0.07**	0.03	0.05	0.05
private developer(s)	0.18***	0.04	0.19**	0.08
total retail space (log)	0.17***	0.01	0.16***	0.03
const	-0.08	0.15	-0.38	0.43
year dummies	+			
No obs	382			
R2	0.46			

Source: own estimations

*Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly" and 2004 are used as reference groups, ** and *** denote significance at 5% and 1% significance level, respectively; robust standard errors*

Now we present our estimation results for different retail areas.

F&B retail revenues The coefficients for "private developer" and "management company" are statistically significant and are positive (see Table 5). However, they are not statistically significant under the between-effects estimator.

Table 5. Revenue model: F&B retail revenues (retail revenue per passenger (log))

	Fixed time effects		Between-effects	
	Coeff	St.dev.	Coeff	St.dev.
a prime operator	0.02	0.04	-0.03	0.08
hybrid structure	0.02	0.03	0.02	0.07
management company	0.09**	0.04	0.08	0.15
multiple prime operators	0.03	0.04	0.01	0.06
private developer	0.12***	0.03	0.12	0.09
f&b retail space (log)	0.17***	0.02	0.17***	0.03
const	-0.59***	0.22	-1.08**	0.50
year dummies	+			
No obs	381			
R2	0.41			

Source: own estimations

*Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly" and 2004 are used as reference groups, ** and *** denote significance at 5% and 1% significance level, respectively; robust standard errors*

Specialty retail revenues

As we can see from Table 6, the coefficients for "a prime operator", "management company" and "multiple prime operators" are positive and statistically significant.

Table 6. Revenue model: Specialty retail revenues (retail revenue per passenger (log))

	Fixed time effects		Between-effects	
	Coeff	St.dev.	Coeff	St.dev.
a prime operator	0.31**	0.16	0.45	0.33
hybrid structure	-0.13	0.11	-0.22	0.22
management company	0.44***	0.11	0.37	0.44
multiple prime operators	0.31**	0.15	0.28	0.19
private developer	0.20	0.14	0.12	0.29
specialty retail space (log)	0.65***	0.05	0.68***	0.07
const	-6.16***	0.42	-6.49***	0.62
year dummies	+			
No obs	188			
R2	0.68			

Source: own estimations

*Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly" and 2004 are used as reference groups, * and *** denote significance at 10% and 1% significance level, respectively; robust standard errors*

News&gifts retail revenues

As we can see from Table 7, the coefficients for "multiple prime operators" and "private developer" are positive and statistically significant. The overall explanatory power of the regression is quite low. Year dummies are statistically significant.

Table 7. Revenue model: News&Gifts retail revenues (retail revenue per passenger (log))

	Fixed time effects		Between-effects	
	Coeff	St.dev.	Coeff	St.dev.
a prime operator	0.13	0.11	-0.16	0.18
hybrid structure	-0.15	0.18	-0.15	0.16
management company	-0.00	0.07	-0.04	0.32
multiple prime operators	0.31***	0.07	0.30***	0.12
private developer	0.18***	0.07	0.15	0.21
N&G retail space (log)	0.08	0.04	0.04	0.07
const	-0.57	0.43	-0.43	0.67
year dummies	+			
No obs	213			
R2	0.12			

Source: own estimations

Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly", and 2004 are used as reference groups; robust standard errors

5.1.2 Retail sales per square foot

Next we present the estimation results for our specification with retail revenue per square foot as a dependent variable (in logs) (see Table 8). Hybrid structure leads to lower retail sales per square foot in case of total retail sales, F&B sales and N&G sales, whereas management company leads to higher retail sales per square foot in case of total sales and F&B sales as compared to the airport directly approach. Private developer generate also less total retail sales than in case of the direct operation by the airport.

Table 8. Revenue model (retail revenue per square foot), fixed time effects[14]

	Total		F&B		SpRet		N&G	
	Coeff	St.dev.	Coeff	St.dev.	Coeff	St.dev.	Coeff	St.dev.
prime operator	0.04	0.06	-0.00	0.08	0.12	0.19	-0.00	0.14
hybrid structure	-0.13**	0.05	-0.13**	0.06	-0.06	0.09	-0.23*	0.16
management company	0.10***	0.04	0.22***	0.06	0.12	0.10	0.24	0.11
multiple prime operators	-0.02	0.05	-0.01	0.08	0.16	0.12	-0.02	0.10
priv developer	-0.11**	0.05	-0.07	0.05	-0.03	0.10	-0.09	0.09
depart pax (l)	0.40***	0.02	0.45***	0.03	0.45***	0.04	0.37***	0.04
const	0.30	0.32	-0.60	0.56	-0.60	0.69	1.06	0.67
year dummies	+		+					
No obs	378		380		194		213	
R2	0.67		0.67		0.43		0.31	

Source: own estimations

[14]The coefficients for concession management approaches under the between-effects estimator were statistically insignificant. Thus, we do not present those results.

*Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly" and 2004 are used as reference groups, ***, ** and * mean significance at 1%, 5% and 10% significance levels, respectively; robust standard errors*

5.2 Rent model

Below we show the results of an analysis of airport revenues from retail rents (see Table 9).

Table 9. Rent model (log rent revenue) (Specification 1)

	Total		F&B		SpRet		N&G	
	Coeff	St.dev.	Coeff	St.dev.	Coeff	St.dev.	Coeff	St.dev.
prime operator	0.01	0.07	0.08	0.06	0.09	0.22	-0.02	0.12
hybrid	0.08	0.06	0.01	0.06	0.50***	0.20	0.20*	0.12
management company	0.20***	0.08	0.19**	0.10	0.87***	0.21	0.19**	0.09
multiple prime operators	0.22***	0.08	0.05	0.06	0.17	0.24	0.39***	0.08
priv developer	0.04	0.16	0.14***	0.05	0.44**	0.23	0.20*	0.11
depart pax (l)	1.18***	0.03	1.18***	0.02	1.23***	0.07	1.02	0.04
const	-3.07***	0.44	-3.76***	0.38	-6.14***	1.15	-1.90	0.62
year dummies	+		+		+		+	
No obs	279		280		176		227	
R2	0.92		0.95		0.70		0.87	

Source: own estimations

*Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly" and 2004 are used as reference groups, ***, ** and * mean significance at 1%, 5% and 10% significance levels, respectively; robust standard errors*

Below we study a direct relationship between retail sales and rent revenue to the airport (see Table 10).

Table 10. Rent model (log rent revenue) (Specification 2)

	Total		F&B		SpRet		N&G	
	Coeff	St.dev.	Coeff	St.dev.	Coeff	St.dev.	Coeff	St.dev.
retail sales (log)	1.05***	0.02	1.04***	0.01	1.02***	0.01	0.94***	0.11
const	-2.85***	0.29	-2.86***	0.25	-2.22***	0.23	-0.87	1.88
year dummies	+		+		+		+	
No obs	285		286		177		227	
R2	0.93		0.96		0.97		0.79	

Source: own estimations

*Note: Estimations are done for 2004-2008, unbalanced panel dataset; "airport directly" and 2004 are used as reference groups, ***, ** and * mean significance at 1%, 5% and 10% significance levels, respectively; robust standard errors*

5.3 Summary of findings

Our major empirical findings are summarized in Tables 11-14 below. Note that only statistically significant results are presented here, based on the time fixed effects model. "Airport directly" concession management approach is used as a reference group. The use of a private developer or management company as well as presence of several multiple prime operators appear to generate more total retail sales per passenger than under the direct operation of the airport (see Table 11). This may be associated with higher customer consumption. Multiple prime operators pay higher rents possibly because of their scale and pricing power. Private developers, hybrid structures and multiple prime operators generate however lower sales per square foot as compared to the direct operation by the airport. Management company generates higher sales and rent revenue than the direct operation.

Table 11. Summary of findings for total retail

	Sales per pax	Sales per sf	Rent revenue
A prime operator			
Hybrid structure		-	
Management company	+	+	+
Multiple prime operators	+	-	+
Private developer(s)	+	-	

Source: based on the results of our estimations

The use of a private developer approach and management company is associated with higher food&beverage retail sales per passenger (see Table 12).

Table 12. Summary of findings for food&beverage

	Sales per pax	Sales per sf	Rent revenue
A prime operator			
Hybrid structure		-	
Management company	+	+	+
Multiple prime operators			
Private developer(s)	+		+

Source: based on the results of our estimations

Running retail business by a management company or by multiple prime operators lead to higher sales per passenger in case of specialty retail (see Table 13).

Table 13. Summary of findings for specialty retail

	Sales per pax	Sales per sf	Rent revenue
A prime operator			
Hybrid structure			+
Management company	+		+
Multiple prime operators	+		
Private developer(s)			+

Source: based on the results of our estimations

Multiple prime operators and private developer generate higher sales per passenger in news&gifts retail area.

Table 14. Summary of findings for news&gifts

	Sales per pax	Sales per sf	Rent revenue
A prime operator			
Hybrid structure		-	+
Management company			+
Multiple prime operators	+		+
Private developer(s)	+		+

Source: based on the results of our estimations

6 Conclusions

According to our preliminary results, we find that as compared to the direct operation of retail concessions by an airport, a private developer, a management company, or multiple prime operators (that appear to foster retail competition) lead to higher consumer consumption (approximated by retail sales per passenger). These approaches may also benefit a retailer (since it gets higher retail sales). While leasing the retail space to multiple prime operators and hiring a management company, the airport appears to get more rent revenue than in case of direct operation. The other effects have been found to be statistically insignificant.

Contribution to the literature on vertical contracts (and probably organization form of business, retail organization form)

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