

USING A CONTINGENT VALUATION APPROACH FOR EVALUATING THE BENEFITS OF AIRPORTS FOR REGIONAL ECONOMIES

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Abstract

Airports play a pivotal role in promoting regional wealth and growth. A multitude of studies have attempted to quantify the impact of airports on regional economies. However, most of these studies measure only the demand effects that are generated by the airport. Possible improvements on the supply side such as productivity gains, optimized supply chains or larger markets are often neglected.

In this paper, we try to quantify the catalytic effects for regional economies that are induced by airports. We apply a contingent valuation approach, based on payment cards, for a secondary airport in Germany and its catchment area. By asking the company's decision makers about their Willingness To Accept (WTA) a compensation for a fictitious closure of the airport, we gain insight into the monetarized importance of the airport, both for airport-using and non-using companies. The clustering of companies, based on their WTA, gives valuable insight into the question as to which industries benefit the most from the airport.

I. Introduction¹

There is little doubt that airports play an important role in regional growth and development. Airports are a fundamental part of the air transport system, which provides access to new markets and increases productivity. This impact of airports is referred to in the literature, as *catalytic effects*. When measuring the effect of airports on regional economies, the key role of airports in facilitating business is often neglected. Instead, studies focus on input-output-analysis that is able to measure the demand effects an airport generates, but not the catalytic effects.

Quantifying the catalytic effects of specific airports is a difficult task. Studies on the importance of transport or airport infrastructure generally use econometrics in order to measure the impact. However, they do not take regional characteristics into account. In principle, it is possible to use airline ticket or cargo revenues at the airport, in order to estimate the benefits companies can generate when using the airport, but these values would yield only a lower limit, as willingness to pay might not be fully exploited by the airlines. Consequently, we use a contingent-valuation approach to quantify the advantages accruing to companies from using a specific airport. The approach is employed with respect to a secondary German airport located within a multi-airport region. By asking the companies' decision makers about their willingness to accept a fictitious permanent airport closure, we gain insight into the monetarized importance of the airport.

The paper is structured as follows:

In section II, we give a brief overview of the kind of catalytic effects that an airport can create. In section III, we employ a contingent-valuation approach in order to measure these effects for a secondary airport in Germany within a multi-airport-region. Section IV concludes.

¹ The authors would like to thank Glenn C. Blomquist, Karl-Hans Hartwig and the participants of the 12th ATRS World Conference Athens 2008 for their valuable comments. Any remaining errors are of our own.

II. Catalytic effects

Most studies on the regional impact of a specific airport employ input-output analysis. They have shown that airports exert significant effects on regional demand.² Input-output studies use a Keynesian demand model based on input-output tables. They estimate the effects on value added, employment, income (and sometimes tax revenue) that result from economic activities taking place at the airport. Companies at the airport site (the airport operator, airlines, ground handling companies, retailers etc.) are important regional employers; they produce goods and services for which they need intermediate and capital goods, thus increasing regional demand. Employees of companies at the airport site and of producers of capital and intermediate goods spend part of their income within the region, also creating additional demand.

Although they provide valuable insight into the demand effects of an airport, input-output studies do not take into account the specific nature of an airport as a transport infrastructure. They treat airports as any other business, neglecting the fact that airports are essential for the functioning of the air transport market, whose services act as a fundamental good for other enterprises. These spin-off-effects from airports are called ‘catalytic effects’ or ‘transportation benefits’.³ Catalytic effects benefit not only those companies that have business contacts (direct or indirect) with the airport, but any other company within the region.⁴ In general, catalytic effects are a result of time saved and cost avoided by using air transportation.⁵ They can be subdivided into three categories: quantitative changes, qualitative changes and improvements to regional competitiveness.

Quantitative catalytic effects

Quantitative catalytic effects are related to the enlargement of markets, due to a reduction in transaction costs.⁶ The use of an airport leads to additional factors flows into the regional economy. Furthermore, export success and the exploration of procurement markets of companies located in the region is dependent on good links to key markets, which can be maintained through airport services. Consequently, aviation enables business travellers to meet current

² For a comprehensive overview on studies for German airports, see Malina / Peltzer / Wollersheim (2006).

³ See ATAG (n.d.), p. 9. Most studies use the term ‘catalytic effects’. Butler / Kiernan (1992) use ‘transportation benefits’.

⁴ See ATAG (n.d.), p. 9

⁵ See Butler / Kiernan (1992), p. 5.

⁶ See Kanafani / Abbas (1987), p. 43.

and prospective customers and thus to expand markets.⁷ Through an increase in market size, economies of scale and scope lead to greater efficiency.

Qualitative catalytic effects

Whereas quantitative effects lead to the expansion of markets, qualitative effects have an impact on production techniques. Many industries use air transport, for instance, to shorten delivery times as part of their just-in-time delivery system. Furthermore, the facilitation of information exchange affects the conduct of economic activities, by increasing efficiency and enabling process changes that can result in the emergence of new activities.⁸ For instance, airport-related travel-cost reductions may lead to an influx of skilled workers. By this, the regional production potential might rise due to the availability of additional knowledge. Thus, air transport links improve networking and collaboration between companies located in different parts of the world, which, in turn, promotes innovation.⁹

Improvement of regional competitiveness

The regional presence of an airport may also increase the competitiveness of companies located within the airport region.¹⁰ Especially those companies that market air traffic affine products have competitive advantages compared to companies located in other regions without direct access to air transport services. Moreover, for some goods and services (such as consulting or logistics services), the presence of appropriate air connectivity is particularly important. For such industries, having an airport within the region is a significant location factor. Therefore, new investments can be attracted and existing companies retained. The availability of air transport services is certainly only one of a number of factors affecting locational investment decisions, but a nearby airport can contribute considerably in getting the region into location shortlists.¹¹

Somewhat surprisingly, while describing the *role* of airports more accurately than *demand* effects, few studies have so far tried to quantify the catalytic effects. This is especially true for the catalytic effects of specific airports.

⁷ See IATA (2007), p. 21.

⁸ See Kanafani / Abbas (1987), p. 43.

⁹ See IATA (2007), p. 21.

¹⁰ See Kasarda / Green / Sullivan (2004) pp. 22 ff. for specific examples.

¹¹ See Robertson (1995), p. 84.

III. Measuring the catalytic effects of airports

The contingent valuation approach

Quantifying the catalytic effects of specific airports' effects is quite a challenge. There are a number of econometric studies on the catalytic impact of (transport) infrastructure in general, starting with the seminal papers of Mera (1973) and Aschauer (1989).¹² Some studies focus on the positive influence of airports on the regional economy.¹³ These studies offer interesting insights into the general catalytic importance of airports. These studies are, however, of less use for the application to individual airports, because they do not take into account regional characteristics such as the degree of airport competition within a regional market. Whereas a monopolistic airport might be of paramount importance for specific companies, the closure of an airport within a multi-airport-region might be negligible for them. In principle, it is possible to measure the importance of a specific airport, based on revealed preferences derived from airline ticket or cargo revenues at the airport, but these values would yield only a lower limit, as willingness to pay may not be exploited fully by the airlines. Moreover, there may also be non-use values for an airport (option value), which cannot be inferred from behaviour observed in the markets.

Therefore, we use a contingent valuation approach (CV) in order to quantify both the use and non-use values of a specific airport. The CV method is a technique based on stated preferences. Respondents' preferences are elicited, by asking them directly to report their Willingness To Pay (WTP) to obtain or retain a specific good or service, or their Willingness To Accept (WTA) a payment for giving up (or not improving of) a particular good or service. CV was developed for non-marketed goods, such as environmental preservation, but is now widely used for other public goods as well.¹⁴

Some studies that CV in an airport context. Baarsma/van Paag (2004), for example, use CV to measure the negative impact of noise that is emitted by airport operation on adjacent communities. CAA (2002) quantified the relative value of using Heathrow airport, compared to other London-based options.

A CV study generally consists of the following elements:¹⁵

¹² See Pfähler / Hofmann / Bönnte (1996) and Bhatta / Drennan (2003) for a detailed review of the relevant studies.

¹³ See Cech (2004), Brueckner (1982), Button / Lall Stough / Trice (1999), Cohen / Morrison Paul (2002), Brueckner (2002), Green (2006).

¹⁴ See Mitchell / Carson (1989), p. 9.

¹⁵ See Mitchell / Carson (1989), p. 3.

1. *A detailed description of the good or service being valued:* The good to be assessed is described in detail. A plausible payment mechanism is shown to the respondent in order to construct a hypothetical market in which the good can be purchased for a certain amount or where compensation for the prohibition of use is offered. Because the values obtained are ‘contingent’ on the hypothetical market described, the approach is referred to as *contingent valuation*.
2. *Questions which elicit the respondents’ WTA or WTP.* The design of the questions should facilitate the valuation process, without biasing the results. The construction of the payment scheme is a challenge for CV-researchers. There are two possible means of payment. The WTP-format measures the maximum willingness to pay for an improvement or non-decrease of a good, whereas the WTA-format measures the smallest compensation that the respondent would accept for a decrease or non-improvement. The choice of the format depends on the underlying property rights for the examined good¹⁶. In addition, an elicitation method has to be chosen. There are four main options. The first and easiest form is the single open question, simply asking the respondent to indicate his WTP or WTA directly. The second option is referred to as the *bidding game*, in which respondents’ maximum WTP or minimum WTA is elicited in an auction. Using the third option, the *referendum method*, a single question is asked as to whether or not the respondent is willing to accept the respective change or perpetuation of the quality or amount of the good for a certain price or compensation (‘take-it-or-leave-it-question’). The fourth option is the *payment card method*. The respondents can choose between different amounts, prices or compensations that are presented on a payment card. Sometime, combinations of these methods (e.g. a two-step referendum in which another amount is tested after a statement on the first was made) are also employed.
3. *Data about the respondents’ characteristics and their preferences which are relevant to the good.* Information on characteristics and preferences of the respondents, which might influence WTP or WTA, are obtained. Questions on the present use guide respondents as to the monetary valuation of the good. Also, they give a concrete impression on the good and its properties that help to avoid effects that might bias the WTA or WTP of respondents’¹⁷.

¹⁶ See Mitchell / Carson (1989), pp. 38 ff.

¹⁷ E.g. warm Glow, symbol bias, see Wronka (2004), pp. 91 ff.

Design and execution of the CV-study for a secondary airport in a multi-airport-region

Typically, CV values are derived from the stated preferences of individuals. In this study, however, we apply it to companies. Therefore, we are not concerned with the impact of an airport on the utility function of households, but on the cost or profit function of companies, which we try to elicit by asking companies decision makers about the value of the airport to the company.

The airport assessed is a secondary airport in Germany with a catchment area of 2.6 million (residents) within one hour access time. The clientele is dominated by small and medium-sized companies. Within its catchment area, the airport faces significant competition from other airports, which have similar infrastructure endowments and traffic figures.

The questionnaire was internet-based and consisted of three main parts:

First, some background questions about the company's characteristics, such as business sector, number of employees and location were asked. This data is needed in order to classify the respondents for the extrapolation of values on the entire population of enterprises within the region. In addition, respondents get used to the questionnaire format by answering easy questions in the beginning, which lowers drop out rates¹⁸.

Second, several questions were asked on specific usage patterns and the importance of the airport to the companies. Respondents were requested to state the quantity and frequency of passenger or cargo flights that they used from that airport. Subsequently, the airport's impact on business contacts, market development, recruitment and costs for the company, were questioned. Respondents then rated the importance of airport infrastructure compared to other locational factors, such as human capital endowment, quality of road and rail infrastructure or the level of local corporate taxes. In addition to yielding insight into the relative importance of an airport, it also helped put into perspective the benefits generated for a particular company, leading to more accurate values for the CV question.

Third, a hypothetical market was constructed to appraise the WTA or WTP for the good, which is described in detail. Companies in the airport region raise a claim on the present quality of airport infrastructure, as airport investments have been financed publicly, using local (and federal) corporate taxes. Therefore, companies believe, that property rights are on their side.

¹⁸ See Roth (1987), p. 165.

Consequently, the WTA format was used in the survey. The payment vehicles chosen for the compensation were a lowered local tax¹⁹ and subsidies by the local government bodies. Because companies are familiar with these payment vehicles, the hypothetical scenario becomes more realistic.

In order to elicit the WTA, the payment card approach was used. In many CV studies, the referendum format is chosen. It is able to create incentive compatibility because it can solve the problem of strategic behavior by respondents.²⁰ Strategic bias occurs, if respondents give strategic answers in order to influence the results of the study in their own interest.²¹ However, due to its dichotomous character, a larger sample is needed to reconstruct willingness to pay from the referendum format. This is especially true, if one tries to elicit the WTA or WTP of companies, as they are much more heterogeneous than households. Households also vary in their compensatory claims according to income or affinity to a certain good, but disparities in WTA or WTP between companies tend to be larger, because turnover, profit and the number of employees vary. Therefore, the payment-card approach was used, which is able to make allowances for the disparities. The CV question is presented in detail in Figure 1.

Figure 1: Content of the CV question

'Imagine the [Name of Airport] is going to be closed, leading to disadvantages for some companies in the region. We conclude from your answers to our questions that your company would be affected negatively. Imagine now, that you are offered an annual compensation for the closing down of [Name of Airport], e.g. by subsidies or lowering local business tax. Please mark the smallest amount that you would accept as compensation. Please bear in mind that the final compensation paid will depend on the average compensation claimed by all respondents and not on your own compensation claim.'

The 24 possible WTA's on our payment card were arranged in a 3 x 8 table plus one field that was marked if respondents wanted to abstain from answering the CV question.²² The flat and broad arrangement was chosen in order to avoid centre bias. The lowest value was zero. All other values were selected according to exponential function, so that the relative differences

¹⁹ This also provides a reasonable constraint to the respondents' estimation of the company's WTA.

²⁰ See Mähler / Vincent (2005), pp.875 ff.

²¹ See Mitchell / Carson (1989), p. 238.

²² See Rowe / Schulze / Breffle (1996), pp.178 for details.

between the values were constant. The highest value was 1.55 m Euros, implying several daily flights of employees. This ceiling was set according to the results of an external pre-test that was conducted after a first, internal pre-test of the comprehensibility and traceability of the questionnaire. Company decision makers participating in the external pre-test completed the questionnaire online at their workstations, as they would do later in the actual survey. Subsequently, debriefing questions were put to the aspects which were incorporated in the stated WTA amount. Moreover, the plausibility of the hypothetical scenario was checked. The participants stated that WTA was estimated mainly on travel time and costs savings, compared to journeys from an alternative airport. Some participants also included values for the 'expression of general appreciation' with respect to the presence of an airport close to their company site.

The field phase started with an e-mail call for participation that was sent to 4,720 companies within the airport region. 891 companies took part in the survey and 819 completed it. The completion rate was 17.2 %.

With the help of the questions regarding usage pattern, a check was conducted to identify and eliminate protest answers. Respondents with a low level of airport usage (or non-use), but who claimed very high WTA-amounts, were eliminated from the sample. Two CV values from respondents who abstained from all but the CV question were also eliminated.

Two general tests were made in order to check the assumed positive correlation of the size of the enterprise and WTA, and the assumed negative correlation of distance from the airport and WTA. Both tests revealed a significant influence on the WTA.

The structure of the sample was then compared with that of the population of companies within the airport region. According to employee-figures, the bank and insurance sector was represented the most (12% of all employees are represented within the sample). Industry (9%), 'industry related services' (7 %) and trade (5%) were also represented very highly.

All in all, survey participants accounted for a compensation claim of 9.0 m Euros, based on the mean that the intervals constituted. The overall WTA was estimated based on sectoral per-employee WTA of the sample using linear regression.²³ The data collected led to estimations of the overall annual WTA-amount of 82 m Euros.

²³ This implies two assumptions. Firstly, the importance of air services grows linearly with the size of company in each business sector. Secondly, the importance for companies of the same size is the same for all firms in the sector.

The industry sector accounts for nearly two thirds of this amount. It has a high WTA amount per employee (340 Euros) and is the most important sector in the airport region, accounting for 32% of all employees. Looking closer at the data, some smaller sectors value airport access even higher. For example, companies belonging to the sector ‘legal or tax advice, consultancy, auditor, bookkeeper’, claimed an average annual compensation of 1,090 Euros per employee.²⁴

The question then arises as to how to interpret the results. In CVs based on households, the overall WTA or WTP depicts the benefit gained or harm suffered by individuals or households, as a result of the existence of a certain public good. In other words, the impact of the good on the utility function is measured. When dealing with companies, one does not analyze utility functions, but profit functions. Therefore, the results obtained in this CV study give an impression of annual actual or prospective extra profits which companies can generate, because of the presence of the particular airport. Without this airport, passengers and cargo would have to use other airports, leading to higher travel time and higher transport costs.

IV. Conclusion

Airports are a fundamental part of the air transport system, which gives access to new markets and increases productivity. When measuring the effect of a particular airport on regional economies, the key role of airports in facilitating business activity is often neglected. Econometric studies offer valuable insight into the general importance of airport infrastructure investment, but they cannot take into account regional characteristics such as the degree of airport competition. Market prices (i.e. ticket or cargo revenues) are only able to indicate a lower boundary of corporate benefits, as companies’ willingness to pay might not be fully absorbed by airlines. Moreover, option values of an airport cannot be derived from market prices.

Therefore, in this paper, we use a contingent-valuation approach, in order to quantify the advantages that companies gain from using a particular airport. The approach is tested on a secondary German airport that lies within a multi-airport region. By asking the company’s decision makers about their willingness to accept a fictitious permanent airport closure, we gain insight into the monetarized importance of the airport. Using an online questionnaire, the WTA is measured by means of a payment-card approach. The companies in the sample ac-

²⁴ The category is a subsample of the sector ‘industry-related services’ which is dealt with as a whole in the projection.

counted for an annual compensation claim of 9.0 m. Euros. The overall annual compensation claim within the airport region is 82 m. Euros, estimated by linear regression of the sectoral per-employee values in the sample. This value provides an impression of the annual actual or prospective extra profits companies can generate, because of the presence of the particular airport. So far, the WTA for companies of the same size within one sector are assumed to be constant, no matter if they have taken part in the survey or not. A subsequent detailed analysis of non-responses will reveal whether this assumption should be changed.

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