On the Public Provision of the Performing Arts

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Abstract: In many countries the provision of the performing arts is assigned to the public sector. Public theaters cover most of their costs by subsidies rather than ticket sales. Moreover, relatively low utilization of capacity suggests that there are large and persistent over-capacities in the market. In this paper theaters and opera houses are modelled as congested public facilities with variable use. Due to large long-run fixed costs in the production of seat capacity, the performing arts have to be provided publicly and to be subsidized in order to maximize welfare. Congestion implies that more capacity than actually needed in terms of tickets sold has to be provided. It is shown that, once a municipality has decided to provide theatrical performances publicly, the theater lobby has the majority to push down the ticket price below the efficient one. The model is tested empirically using German data for 124 municipalities with 152 public theaters. Our results confirm both, diminishing average costs and congestion, and indicate inefficiently low ticket prices. The public theater sector as a whole is found to work inefficiently as the efficient ticket price was above the maximum willingness-to-pay in the market.

Keywords: Performing Arts, Public Facilities, Congestion

JEL Classification: H40, D71, Z10
Towards gold throng all,
To gold cling all,
Yes, all! Alas, we poor!\(^1\)

## 1 Introduction

Among the many aspects of the performing arts that have either been or could be modelled economically,\(^2\) we focus on three “stylized facts” in this paper: First, in many countries, such as France, Germany, and the United Kingdom, the provision of the performing arts is essentially assigned to the public sector. Second, publicly run theaters usually have relatively low box-office returns. Third, the rate of capacity utilization is far below 100%, that is, there is a large and persistent excess supply of seats. For example, in the 1998/99 season Germany’s towns and cities provided 152 public and 209 private playhouses, opera houses and musical theaters.\(^3\) The average box-office returns of Germany’s public theaters were only 15.3% of their total operating costs, corresponding to a subsidy of 87 Euros per ticket sold. In fact, most of the so-called private theaters (73%) received large subsidies by their municipal or state governments, too. Subsidized private theaters on average needed an allowance of 18 Euros per visitor to survive economically. Germany’s public theaters could enter a utilization ratio of no more than 73% in the books. Even for the economically successful ones among the private theaters the picture was rather similar.

In order to explain these empirical observations, we develop a formal model in which theaters are modelled as public facilities with variability in the use. Due to considerable fixed costs in the production of seating capacity, the performing arts are provided either publicly or by a private monopolist. We show that, if there is a majority favoring public provision and subsidization, then an even larger majority of consumers will gain from pushing down the ticket price below the welfare-maximizing one. Furthermore, it is assumed that the consumption of the performing arts is subject to congestion, that is, an additional spectator reduces the benefits of the other spectators. Hence, if marginal congestion costs are relatively high, there is an incentive to provide more capacity than actually needed in terms of tickets sold.

The model is tested empirically using the data of 152 public German theaters for the 1998/99 season. Our results support both initial assumptions, diminishing average costs in the production and congestion in the

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\(^1\)Margaret in Goethe’s Faust, Scene 8.
\(^2\)For an overview see Blaug (2001).
\(^3\)Data Source: Deutscher Städtetag (2000).
consumption of the performing arts. Using our estimates for the marginal
provision and congestion costs, we are able to show that actual ticket prices
were significantly below the efficient ones. In fact, our data suggests that the
public theater sector as a whole operated inefficiently since the average effi-
cient ticket price would have had to be higher than the estimated maximum
willingness-to-pay for a ticket.

The paper is organized as follows: In the next section we present our model
of the performing arts. In Section 3 we expose the model to an empirical test
using German data for the 1998/99 season. In Section 4 the paper offers some
concluding remarks.

2 The Model

How should the performing arts be modelled? First of all, an adequate out-
put measure is to be determined. While some authors used qualitative output
measures such as the source material, the technical standard of a performan-
ce and its benefits to the audience, the society and the specific form of art,4
we want to devote our model to the quantitative aspects of the performing
arts solely. As noted by Throsby (1990), the perception of quality certainly
plays an important part in demand and supply decisions in the performing
arts. However, leaving alone the subjectivity of quality perception, almost all
qualitative output measures lack a clear relation to input and, thus, produc-
tion costs. For instance, a modern one-man play with almost zero production
costs may provoke the same (positive or negative) response as a monumental
production in a classical style. According to Throsby and Withers (1979) the
quantitative aspects of the performing arts are best measured in terms of
seats, number of performances and total seating capacity.

The pioneers of the economics of the performing arts, Baumol and Bowen
(1966), once wrote: “The arts are public goods . . . failure of the government
to provide funds may constitute a very false economy” (p. 385–386). From
today’s angle we would certainly not agree with this statement. First, for a
given seating capacity, there is—at least for popular plays—some degree of
rivalry, which manifests in queues in front of the ticket office or in the noise
level of a full house. Second, consumers can easily be excluded at the ticket
office or at the front door of the theater. Third, even the intensity of usage can
be varied by the spectator. Thus, a theater or a opera house is the typical case

4This catalogue is due to Throsby and Withers (1979). Using press reviews as the input
for the latter four categories of this catalogue, Throsby (1990), for example, assessed the
quality of three theater companies in Sydney. See also Globerman and Book (1974) and
of a congested variable-use public facility. The efficiency conditions for the provision of such goods were studied, for example, by Oakland (1972) and Sandmo (1973). Glazer and Niskanen (1997) showed that a poor majority may prefer the provision of low-quality and overcrowded public facilities, such as schools, to discourage use by the rich minority.

Due to their excludability the performing arts could be provided privately. Many reasons have been put forward to justify public provision nevertheless. Musgrave (1957) argued that the performing arts have the character of a merit good which should be provided by the state on paternalistic grounds. There are, however, arguments more in line with neoclassical welfare economics: Theaters may create positive externalities to the producers of complementary goods such as hotels and restaurants. Penne and Shanahan (1987) showed that US cities deliberately used arts investments as a tool to stimulate city development. Spatial externalities or spillovers could require a money transfer to cities operating performing arts organizations. Baumol and Bowen (1966) argued the performing arts would suffer from the “cost disease” (that is, low productivity gains, rising labor costs and an elastic ticket demand). Many empirical papers, however, found inelastic demand curves for the performing arts (see, for example, Touchstone 1980, Lange and Luksetich 1984, and Felton 1992).

From an empirical point of view, another reason speaks on behalf of public provision of the performing arts, namely fixed-costs regression. Diminishing fixed costs in the provision of absolute seat capacity or per-capita seat capacity were documented, for example, by Baumol and Bowen (1966) for US symphony orchestras, Globerman and Book (1972, 1977) for Canadian theaters and orchestras, Lange et al. (1985) and Lange and Luksetich (1993) for Australian symphony orchestras, Gray (1992) for Norwegian theaters, Hjorth–Andersen (1992) for Danish theaters and Krebs (1996) for German theaters. See also the many references stated in Blaug (2001). In the following, we therefore assume that the production of capacity in terms of seats per capita is subject to large fixed costs. Hence, the supply of performing arts will get monopolized if the provision of the performing arts is not assigned to the public sector.

2.1 The Demand for Performance

We consider a municipality of $N$ citizens. Let $Y$ denote income, $Z$ theatrical performance in terms of seats, and $X$ a composite private good, where $Y, X \in \mathbb{R}_+$ and $Z \in \mathbb{Z}_+$. The price of $X$, $p_X$ is set equal to one, $p_X = 1$, and used as the numeraire. Additionally, we normalize income to one. Hence, a citizen’s
normalized budget constraint is given by
\[ 1 = x + p z, \] (1)
where \( x \) and \( z \) are the consumption of \( X \) and \( Z \), respectively, and \( p \) is the relative price of an admission ticket in units of \( X \) per unit of \( Z \) (that is, per seat).

Besides the ticket price \( p \) there are additional private costs of attending a performance. These additional costs will be denoted by \( \Gamma \) in the following and represent the congestion costs that arise if the ratio between the demand per capita for a specific stage play \( q \) and the (per capita) number of seats available for that play \( s \) (the capacity of the theater) becomes relatively large. By congestion we mean that if the rate of capacity utilization
\[ L = \frac{q}{s}, \] (2)
becomes larger, this implies that people have to stand in long queues to secure themselves a ticket, that neither the most preferred dates nor seats will be available, etc. We assume the congestion function to be homogeneous of degree zero
\[ \Gamma(q, s) = \Gamma \left( \frac{q}{s} \right) = \Gamma(L), \] (3)
that is, the degree of congestion is not affected by proportional changes of \( q \) and \( s \).\(^5\) Furthermore, we set \( \Gamma(0) = 0 \) and \( L > 0 \), where the latter assumption means that the relationship between congestion and utilization of capacity is monotonic.\(^6\)

We assume that utility is quasi-linear and takes the form
\[ U(x, z) = x + u(z). \] (4)
Substituting the budget constraint (1) into (4) yields
\[ U(x, z) = 1 - pz + u(z). \] (5)
Furthermore, we assume that all citizens exhibit the same utility function except for one parameter, namely the (net) reservation price for an admission ticket \( \zeta \).

A citizen has to make a discrete choice on either buying an admission ticket or not, that is, her choice set is given by \( Z = \{0, 1\} \), where 0 stands for
\(^5\)Oakland (1972) showed that this condition is necessary for optimal user charges to cover the costs of production of a public facility.
\(^6\)Of course, in the real world, almost nobody would like to sit in an empty theater. Alternatively, one could assume that there is an u-shaped relationship between \( \Gamma \) and \( L \).
staying at home and 1 for attending a performance, respectively. Accordingly, the gross reservation price is given by the solution of

$$1 + u(0) = 1 - \zeta^g + u(1)$$

for $\zeta^g$. Setting $u(0) = 0$ yields $\zeta^g = u(1)$, that is, the gross reservation price is just the utility of attending a performance.

Taking congestion into account, the gross reservation price is given by the difference between the net reservation price $\zeta$ and the disutility from congestion: $\zeta^g = \zeta - \Gamma(L)$. Hence, we arrive at the following equations for individual demand and indirect utility

$$p \begin{cases} \leq \zeta - \Gamma(L) \Rightarrow z = 1 \\ > \zeta - \Gamma(L) \Rightarrow z = 0 \end{cases}$$

and

$$z = \begin{cases} 0 \Rightarrow U = 1 \\ 1 \Rightarrow U = 1 + \zeta - p - \Gamma(L) \end{cases}.$$  

The marginal externality caused by a citizen who decides to buy a ticket is given by

$$dU = -\frac{1}{\zeta} \frac{1}{\sqrt{\zeta}} dq < 0.$$  

In order to derive the total demand curve for performance, assumptions have to be made about the distribution of $\zeta$. Empirical studies have shown individual preferences for the consumption of performance to depend positively on several characteristics such as income, education, and exposure to the performing arts during childhood (see, for example, Blaug 2001 and the references stated therein). Since we abstract from the citizens’ personal characteristics in our model, we assume for simplicity that the maximum and minimum reservation price are given by $\bar{\zeta}$, $\zeta \leq 1$, and 0, respectively, and that on this interval all reservation prices are equally likely. Formally, we have

$$\zeta \sim \text{Uni}(0, \bar{\zeta}).$$

Integrating over $\zeta$ gives the total demand relation

$$q = \begin{cases} 0 \quad \text{for } p > \bar{\zeta} - \Gamma(L) \\ 1 - \int_0^{p + \Gamma(L)} \frac{1}{\zeta} d\zeta \quad \text{for } p \leq \bar{\zeta} - \Gamma(L) \end{cases},$$

$$q = \begin{cases} 0 \quad \text{for } p > \bar{\zeta} - \Gamma(L) \\ 1 - \frac{1}{\zeta} [p + \Gamma(L)] \quad \text{for } p \leq \bar{\zeta} - \Gamma(L) \end{cases}.$$
In order to analyze the above expression more closely, we write (12) as an implicit function

\[ q - 1 + \frac{1}{\zeta} \left[ p + \Gamma \left( \frac{q}{s} \right) \right] = 0 \quad (13) \]

and differentiate \( \Phi \) with respect to \( q, s, \) and \( p \):

\[
\frac{dq}{dp} = - \frac{\Phi_p}{\Phi_q} = - \frac{1}{\zeta + \Gamma s} < 0, \quad (14)
\]

\[
\frac{dq}{ds} = - \frac{\Phi_s}{\Phi_q} = \frac{\Gamma'}{\zeta s^2 + \Gamma' s} > 0. \quad (15)
\]

Equation (14) shows that the demand curve for performance is flatter (less elastic) with respect to price changes if congestion costs are taken into account. This is due to the fact that the right term in the denominator is positive and mutes the effect of a price increase by a decrease of congestion. Equation (15) shows that an increase in capacity unambiguously increases demand.

Before we can analyze by whom and how a municipality’s theater will be directed, we have to further specify the congestion function. We proceed on the assumption of constant marginal congestion cost \( \gamma, \gamma > 0 \), and let \( \Gamma \) take the form

\[ \Gamma = \gamma q \frac{s}{s}, \quad (16) \]

where \( \gamma \) has the same dimension as \( p \) (\( X \) units per seat). The functional form (16) makes calculations relatively easy but has some disadvantages. In particular, it allows for “over-congestion”, that is, \( s < q \). Admittedly, “over-congestion” seems to be more realistic with regard to other public facilities such as public transport, the road system, and parks and recreation than with regard to a municipal theater where seats are usually numbered and will not be sold twice for the same performance. In fact, several empirical studies indicated “over-congestion” of a variety of publicly provided services and facilities (see Reiter and Weichenrieder 1999 for a survey). Accepting the congestion function (16), inverse demand is given by

\[ p = (1 - q) \zeta - \gamma q \frac{s}{s}. \quad (17) \]

2.2 The Supply of Performance

2.2.1 The Cost Function

As discussed before, the output of a theater is measured purely quantitatively. Capacity \( s \) is produced by means of a technology exhibiting considerable
long-run fixed costs. We assume that the cost function
\[ C = C_f + \alpha s \]  
(18)
is dual to the production function, where \( C \) denotes the total costs of providing \( s \), \( C_f \) the fixed costs, and \( \alpha \) the (constant) marginal costs. Note that \( C \) and \( C_f \) are measured in terms of \( X \) units per capita and per performance and \( s \) is measured in terms of seats per citizen and per performance; \( \alpha \) has the same dimension as \( \gamma \) (\( X \) units per seat).

Since the provision of capacity involves fixed costs, average costs shrink the more seats per capita and performance are offered. A theater’s profit (in units of \( X \) per capita and performance) is given by
\[ \Pi = pq - C_f - \alpha s . \]  
(19)
We assume that all gains and losses of the theater are shared equally by the citizens.

\section*{2.3 Laissez Faire}

First, we consider the laissez-faire equilibrium. With diminishing average costs, only one theater will survive in the long run at each municipality.\(^7\) Hence, its director will behave as a monopolist and choose price and capacity to maximize her institution's profit, that is, \( \{p^M, s^M\} = \arg \max_{p,s} \Pi \).

Substituting (17) into (19) and differentiating with respect to \( q \) and \( s \) yields the two necessary conditions for a profit maximum:
\[ MR_q = \tilde{\zeta}(1 - 2q) - 2\gamma \frac{q}{s} \overset{!}{=} MC_q = 0 \]  
(20)
and
\[ MR_s = \gamma \frac{q^2}{s^2} \overset{!}{=} MC_s = \alpha . \]  
(21)
Solving (20) and (21) together with (17) yields monopoly price, capacity, and demand:
\[ p^M = \frac{\tilde{\zeta}}{2}, \]  
(22)
\[ s^M = \frac{1}{2} \sqrt{\frac{\gamma}{\alpha \tilde{\zeta}}} - \frac{\gamma}{\tilde{\zeta}}, \]  
(23)
\[ q^M = \frac{1}{2} - \frac{\sqrt{\alpha \gamma \tilde{\zeta}}}{\tilde{\zeta}}. \]  
(24)
\(^7\)We do not consider spatial externalities here.
Note that $\gamma \geq \alpha$ implies $s^M \geq q^M$. If there was no congestion, we would have

$$p^M = \frac{\bar{\zeta} + \alpha}{2},$$

$$s^M = q^M = \frac{1}{2} - \frac{\alpha}{2\bar{\zeta}}.$$  \hfill (25)

The determination of price and capacity under laissez faire is depicted in Figure 1.

In Sector I of the figure, the number of tickets sold and the price for an admission ticket are determined for a given capacity. Sector II determines capacity and price for a given number of tickets sold. In the fourth sector, capacity and number of tickets sold are computed for a fixed price. Sector III, finally, mirrors the capacity of the theater to Sector IV. $D^q$ is the graph of the inverse demand function (17) with respect to $p$ and $q$, given $s$. $\bar{\zeta}$ on the price axis is the highest reservation price and the $D^q$ intersects the $q$ axis at $\bar{\zeta}s/(\bar{\zeta}s + \gamma)$. The higher the capacity offered, the flatter the inverse demand curve, that is, the more price elastic demand. $MR_q$ is the marginal revenue curve of the theater; since marginal cost are zero with respect to $q$, the intersection of $MR_q$ with the $q$ axis determines the profit maximizing price which is $\bar{\zeta}/2$. The dashed line $\Gamma$ is the gross marginal benefit curve of the audience without congestion. Shifting this line parallel down until it intersects with $D^q$ at the monopoly price gives the average congestion costs $\Gamma$. 


In Sector II \( D^* \) is the graph of (17) with respect to \( p \) and \( s \), that is, the demand for capacity. \( MR_s \) and \( MC_s \) are the marginal revenue and marginal cost curves, respectively, with respect to capacity, where the latter is just a constant \( \alpha \). As \( MR_s \) also depends on \( q \) [see equation (21)], a larger \( q \) will shift the intersection between marginal revenue curve and marginal cost curve to the left, that is, a larger capacity will be offered. The total variable costs of providing the monopoly capacity are just the area below the marginal costs curve between 0 and the profit maximizing capacity \( q\sqrt{\gamma/\alpha} \). It is the goal of the monopolistic director to maximize the difference between the shaded area in Section I, the revenue of the theater, and the shaded area in Section II, the variable costs of providing the respective capacity.

**Fig. 1** Profit maximizing directorship
2.4 Welfare Maximization

While a monopolistic directorship focusses on marginal revenues and costs only, a welfare maximizing director, a social planner, would choose \( p \) and \( s \) to maximize the sum of the utilities of the municipality’s citizens \( \{p^W, s^W\} = \arg \max_p s_p W \), where every citizen is given the same weight. The welfare of a municipality is given by

\[
W = \int_0^{\tilde{\zeta}} (1 + \Pi) \frac{1}{\zeta} d\zeta + \int_{\Pi + \gamma \frac{q}{s}}^{\tilde{\zeta}} \left( \zeta - p - \gamma \frac{q}{s} \right) \frac{1}{\zeta} d\zeta. \tag{27}
\]

Note that the first integral is just revenue minus costs plus one and the integral to the right is consumer surplus.

Solving the necessary conditions for a welfare maximum \( MU_q + MR_q = MC_q \) or

\[
\tilde{\zeta} q + \tilde{\zeta} (1 - 2q) - 2 \gamma \frac{q}{s} = 0 \tag{28}
\]

and \( MU_s + MR_s = MC_s \) or

\[
0 + \gamma \frac{q^2}{s^2} = \alpha \tag{29}
\]

together with (17) for \( p, s, \) and \( q \) yields

\[
p^W = \sqrt{\alpha \gamma}, \tag{30}
\]

\[
s^W = \sqrt{\frac{\gamma}{\alpha} - 2 \frac{\gamma}{\zeta}}, \tag{31}
\]

\[
q^W = 1 - 2 \frac{\sqrt{\alpha \gamma}}{\zeta}. \tag{32}
\]

If there was no congestion, we would have

\[
p^W = \alpha, \tag{33}
\]

\[
q^W = 1 - \frac{\alpha}{\zeta}. \tag{34}
\]
Figure 2 shows the determination of $p^W$, $s^W$, and $q^W$. In Sector I, the welfare maximizing director takes into account not only the marginal revenue curve $MR_q$ but also the marginal utilities of those attending a performance given by $MU_q$. The curve of $MU_q$ is increasing in $q$ as a higher $q$ means additional net benefits, because the price decrease associated with the respective increase in $q$ is always smaller than the increase in congestion. As compared to the laissez faire solution, the welfare maximizing prize will be smaller and the number of tickets sold and the capacity will be larger. Hence, in Sector II, $MR_s$ and $D^s$ are shifted to the left. Furthermore, as depicted in Sector IV, a lower price means that the graph of $q$ as a function of $s$ has less curvature than under monopolistic directorship.
2.5 A Club

Generically, when we talk about a club, there are two ways of maximizing its welfare: Either the director maximizes the utility of the club’s representative member or of the club as a whole. For simplicity and clarity of the results, we consider the former case only.

The director chooses $p$ and $s$ to maximize the utility of a representative club member with $\zeta > p + \Gamma$, that is, $\{p^C, s^C\} = \arg\max_{p,s} U^C$, where the objective function is given by

$$U^C = 1 + \Pi + \zeta - p - \gamma \frac{q}{s}. \quad (35)$$

Solving the necessary conditions for a utility maximum $MU_q + MR_q = MC_q$ or

$$\tilde{\zeta} + \tilde{\zeta}(1 - 2q) - 2\gamma \frac{q}{s} = 0 \quad (36)$$

and $MU_s + MR_s = MC_s$ or

$$0 + \gamma \frac{q^2}{s^2} = \alpha \quad (37)$$

together with (17) for $p, s, and q$ yields

$$p^C = 0, \quad (38)$$
$$s^C = \sqrt{\frac{\gamma}{\alpha} - \frac{\gamma}{\zeta}}, \quad (39)$$
$$q^C = 1 - \frac{\sqrt{\gamma \alpha}}{\zeta} \quad (40)$$

and

$$p^C = \frac{1}{2} \alpha \quad (41)$$
$$q^C = 1 - \frac{\alpha}{2\zeta} \quad (42)$$

if there was no congestion.
Fig. 3 Provision of Performance as a Club

Figures 3 shows how \( p^C, s^C, \) and \( q^C \) are determined. The goal of the club director is to maximize the difference between the shaded areas in Sectors I and II. The club director is interested only in the marginal welfare of the representative club member made up by the two components \( MU_q \) and \( MR_q \). At the optimum capacity of the club, marginal revenue is negative and just offsets marginal utility.

### 2.6 Social Consensus

To summarize the preceding three subsections, ticket prices will be lowest for a club and highest for a monopolistic directorship. The welfare maximizing, efficient ticket price is just the square root of the product of the marginal provision costs and the marginal congestion costs:

\[
0 < \sqrt{\alpha \gamma} < \frac{\tilde{c}}{2}. \tag{43}
\]
Capacity and ticket demand will be highest under club directorship and lowest under monopolistic directorship.\(^8\)

Let us assume that, in an initial state, the citizens of a municipality have to decide on the provision mode of the performing arts. Which type of directorship will emerge?

**Result 1 (Private Provision)**  *If citizens neither know their own preferences nor the distribution of preferences, the social consensus is private provision of performance.*

The argument for this result is as follows. If people have to decide from under a veil of ignorance on the provision of the performing arts, by lack of distributional information, the principle of insufficient reason applies. That is, one assumes in the worst case not to be interested in theater at all. The indirect utility under the different directorships of a citizen not planing to attend a performance is given by

\[
U_0^M = 1 - C_f - \sqrt{\alpha \gamma} + \frac{\alpha \gamma}{\zeta} + \frac{\zeta}{4}, \quad (44)
\]
\[
U_0^W = 1 - C_f, \quad (45)
\]
\[
U_0^C = 1 - C_f - \sqrt{\alpha \gamma} + \frac{\alpha \gamma}{\zeta}. \quad (46)
\]

Hence, we have \(U_0^M > U_0^W > U_0^C\). Accordingly, from an ex-ante point of view, citizens will decide to let the monopolist provide theatrical performances and to collect their shares of the relatively large monopoly profits as compared to the other two regimes.

The situation changes if the distribution of preferences is common knowledge.

**Result 2 (Public Provision)**  *If citizens do not know their own preferences but only their distribution, then the social consensus is public provision of performance.*

The argument is straightforward: The indirect utility of a citizen who decides to buy a ticket is given by

\[
U_1^M = U_0^M + \zeta - \frac{\zeta}{2} - \sqrt{\alpha \gamma}, \quad (47)
\]
\[
U_1^W = U_0^W + \zeta - 2\sqrt{\alpha \gamma}, \quad (48)
\]
\[
U_1^C = U_0^C + \zeta - \sqrt{\alpha \gamma}. \quad (49)
\]

Note that \(p^M\) exceeds \(p^W\) only if the maximum willingness-to-pay for an admission ticket exceeds the welfare-maximizing price by factor two, that is, \(\zeta > 2\sqrt{\alpha \gamma}\). This seems to be reasonable and will be assumed in order to derive the following results.
where the expression to the right is consumer surplus. Integrating over $\zeta$ gives us the expected utility of a citizen under the different directorships:

$$EU^M = 1 - C_f + \frac{1}{2} \zeta - 2\sqrt{\alpha \gamma} - \frac{1}{2} \alpha \gamma - \frac{1}{2} \zeta + \frac{1}{2} \sqrt{\alpha \gamma}, \quad (50)$$

$$EU^W = 1 - C_f + \frac{1}{2} \zeta - 2\sqrt{\alpha \gamma}, \quad (51)$$

$$EU^C = 1 - C_f + \frac{1}{2} \zeta - 2\sqrt{\alpha \gamma} - \frac{1}{2} \alpha \gamma. \quad (52)$$

Hence, we have $EU^W > EU^C > EU^M$, where the latter inequality applies for $\zeta > 4\sqrt{\alpha \gamma}$.

However, as soon as the theater opens its gates, the citizens get to know their preferences.

Result 3 If citizens know their own preferences, then the performing arts will be provided either by private monopolists or publicly as a club good.

From Subsections 2.4 and 2.5 we know that $q^W < q^C$, the difference being $\sqrt{\alpha \gamma}/\zeta$. Moreover, as long as the condition $\zeta > 2\sqrt{\alpha \gamma}$ holds, we have $q^C > 0.5$. Hence, if the social consensus was public provision, then there will be an absolute majority of citizens willing to deviate from the social consensus. The members of the “theater club” will push down ticket prices below the welfare maximizing ones in order to increase their own welfare. If the social consensus was private provision, all depends on whether the majority is allowed to change the mode of provision from private to public. If the provision of the performing arts stays in private hands, then only a (small) minority of citizens will attend theatrical performances [see equation (24)].

3 Empirical Test

3.1 The Data

For our empirical test of the model we used data drawn from the Statistical Yearbook of German Municipalities which was provided by the Deutsche Städteetag, the convention of all German municipalities (see Deutscher Städteetag 2000). The Yearbook lists structural data such as population size and budget for all German towns and cities with more than 10,000 inhabitants. A special chapter is concerned with public and private theaters and symphony orchestras. All performing arts organizations are listed with their different stages, the number of seats and performances offered, the number of visitors and the degree of capacity utilization. Moreover the table contains
information about operating expenses and revenue as well as the sources and the amounts of subsidization.

We used the data of the 1998/99 season. Table 1 lists the most important output measures of German theaters for that season. In cities where more than one public performing arts organization exist, we aggregated the respective data on seat capacity etc., that is, the sample size was 124. Note that all prices were converted from Deutschmarks into Euros.

**Tab. 1 Output of German Theaters in the 1998/99 Season**

| Municipalities with Public Theaters | 124 |
| Performing Arts Organizations     | 154 |
| Stages                            | 729 |
| Performances                      | 63,929 |
| Total Seat Capacity               | 28,037,946 |

### 3.2 Hypotheses

Our main hypothesis is that the average price for an admission ticket in Germany was below the welfare-maximizing price in the 1998/99 season. Formally, we have

\[ H_0 : p \geq \sqrt{\alpha \gamma} \quad \text{vs.} \quad H_1 : p < \sqrt{\alpha \gamma} . \]  

We estimated a modified inverse demand equation and a modified cost function in order to obtain the required estimates for the marginal congestion costs \( \hat{\gamma} \) and the marginal provision costs \( \hat{\alpha} \). Instead of the original cost function (18), we estimated

\[ \tilde{C} = \tilde{C}_f + \hat{\alpha} S + \varepsilon_1 , \]  

where \( \tilde{C} \) is the per-capita operating expenses in Euros of all performing arts organizations of a municipality, \( \tilde{C}_f \) is the per-capita fixed costs in Euros, \( S \) is the number of seats per citizen and \( \hat{\alpha} \)—the marginal provision costs—has the dimension Euros per seat. \( \varepsilon_1 \) is a disturbance term.

The second equation determines the marginal congestion costs. Instead of (17), we estimated

\[ p_Z = \frac{p_{Z}^{\max}}{Q_{Z}^{\max}} - \frac{I_Z^{\max}}{Q_{Z}^{\max}} Q - \hat{\gamma} L + \varepsilon_2 , \]  

where \( p_Z \) is the average ticket price (operating revenue divided by the number of visitors) in a municipality in Euros per seat, \( p_{Z}^{\max} \) is the maximum
willingness-to-pay for a ticket in Euros per seat, $Q^\text{max}$ is the maximum number of ticket sold per citizen, $Q$ is the average number of tickets sold per citizen, $L$—the degree of capacity utilization—is unitless and $\gamma$—the marginal congestion costs—is measured in Euros per seat. $\epsilon_2$ is a disturbance term. Thus, the efficient price in Euros per seat would be $\hat{p}^W = \sqrt{\hat{\alpha} \hat{\gamma}}$.

### 3.3 Results

Since the errors of the equations (54) and (55) are likely to be correlated (seemingly unrelated regression), we estimated both equations jointly using generalized least squares (GLS). The results are reported in Table 2.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Wert</th>
<th>Std.F.</th>
<th>$T$</th>
</tr>
</thead>
<tbody>
<tr>
<td>supply equation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\hat{C}_f$</td>
<td>23.850</td>
<td>6.873</td>
<td>**3.470</td>
</tr>
<tr>
<td>$\hat{\alpha}$</td>
<td>51.345</td>
<td>3.360</td>
<td>**15.282</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.645</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>224.620</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>&lt; .01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>124</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>demand equation</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{p}^\text{max}_Z$</td>
<td>36.753</td>
<td>5.857</td>
<td>**6.275</td>
</tr>
<tr>
<td>$\hat{p}^\text{max}_Z/Q^\text{max}$</td>
<td>3.184</td>
<td>1.157</td>
<td>**2.752</td>
</tr>
<tr>
<td>$\hat{Q}^\text{max}$</td>
<td>11.544</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\hat{\gamma}$</td>
<td>26.473</td>
<td>8.110</td>
<td>**3.264</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>7.990</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>&lt; .01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>124</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the model is very good. The $R^2$ and $F$ statistics indicate significance of both regressions. Moreover, all parameters are significant at least at the 5% level. We estimated fixed costs of about 24 Euro per capita and marginal provision costs of a bit more than 50 Euros per seat. The estimates for the demand equation show a maximum willingness-to-pay of 36 Euros per ticket (average of the 124 municipalities). On average, the maximum number of (different) performances visited by a citizen was between 11.5. This estimate comes pretty close to the number of a season’s new productions, which around 12 for most German theaters. Eventually, for the marginal congestion costs we obtained an estimate of 26 Euros per seat, about half of
provision costs.

The welfare-maximizing price would be 36.87 Euros per seat. The average price for an admission ticket to one of Germany’s public theaters in the 1998/99 season was 14.19 Euros and its standard error 1.07. Hence, the null hypothesis is strongly rejected ($t = -21.19, p < .01$). This confirms our main hypothesis that actual ticket prices were far below the efficient ones. Interestingly enough, the efficient ticket price even exceeds the maximum willingness-to-pay (36.75 Euros per seat). This means that in an average city with average citizens nobody would be willing to pay the efficient ticket price. In other words, there would be no demand for theater without subsidies; yet subsidizing the performing arts would cause a net loss of welfare. This means that (public) provision of the performing arts can only be justified on grounds of external utilities or profits that are not covered by the model.

4 Conclusion

In this paper we focussed on three “stylized facts” concerning the provision of the performing arts. First, in many countries the provision of the performing arts is assigned to the public sector. Second, public theaters cover most of their costs by subsidies rather than ticket sale. Third, public (and also most private) theaters exhibit a relatively low utilization of capacity. We modelled theaters and opera houses as congested public facilities with variable use. Furthermore, we assumed that seat capacity is produced with diminishing average costs. Congestion implies that more capacity than actually needed in terms of tickets sold has to be provided. It was shown that, once a municipality has decided to provide theatrical performances publicly, the theater lobby posses the majority to push down the ticket price below the efficient one.

The model was tested empirically using German data for 124 municipalities. Our results confirmed both, diminishing average costs and congestion, and indicated inefficiently low ticket prices. The public theater sector as a whole was found to work inefficiently as the efficient ticket price exceeded the maximum willingness-to-pay in the market.

Given these empirical observations, the crucial question as to use of public provision and subsidization of the performing arts has to be posed. Of course, there certainly are some theaters for which the willingness-to-pay actually exceeds the welfare-maximizing ticket price. Yet, for the bulk of theaters and opera houses applies that they consume more resources than they create in terms of utility. Only if positive externalities arise from the provision of the performing arts, which were not taken into account by the model, the public
provision and subsidization of performing arts organization is justified on efficiency grounds. But these externalities have, to our knowledge, never been quantified empirically (though there are attempts; see Penne and Shanahan 1987). On the other hand, the performing arts organizations themselves must decrease their operating expenses. In Germany the first public theaters have been closed or their further existence has been put into question due to the municipalities’ severe budget crisis.

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References


