Some Simple Analytics of Access and Revenue Targets*

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Abstract. If a museum faces a price inelastic demand and twin targets of a minimum number of visits and a minimum revenue, those targets need not be compatible. This paper explores the implications of such targets and shows that their compatibility depends critically on the admission price-elasticity. If the targets are incompatible it may be possible to engineer compatibility by shifting the demand curve. However, if the demand shift (eg resulting from advertising or improving the quality of the visitor experience) requires resourcing and is to be self-financing, it may or may not be possible to bring about compatibility.

Key words: access, revenue, targets, price elasticity

1. Introduction

The purpose of this paper is to explore the ways in which a museum sets its admission price, given access and revenue targets. Although the analysis is developed in the context of a museum, it is of relevance in many other contexts and all references below to a “museum” are to be understood as any similar economic organisation.

“Access” is here defined as the number of visits per time period. Visitor composition (broken down by socio-economic grouping, age, sex, geographic origin, length of stay, first-time or repeat visitors etc.) is not examined. A museum may, of course, be interested in these micro-aspects of the visitor flow, but they are not addressed here. The concept of revenue focuses on that from admission charges and, therefore, the paper does not concern itself with the revenue from ancillary activities (the museum shop, restaurant etc.), donations, sponsorships and subsidies (whether public or private). Also, the paper abstracts from the cost structure of the museum,¹ and from the potential cost-reductions implicit in the imputed value of volunteers’ activities.

Section 2 of this paper explores the potential conflict between revenue and access, especially in the context of price-inelastic demand; Section 3 concludes and identifies a set of important questions which form a research agenda.²

2. The Access/Revenue Conflict

The effective price faced by a visitor to a museum comprises several elements which include the cost of travel to the attraction, subsistence expenditure and the entrance fee. It is quite likely that, in such cases, the entrance fee will form a
relatively small proportion of the total effective price and it is then likely that in a demand study the observed entrance-price elasticity of demand will be small. Formally, demand is said to be price-inelastic if, as the price rises the demand falls in smaller proportion than the price rise. Thus demand is price-inelastic if, for example, the price rises by 10% but demand falls by less than 10%. It may be the case that the elasticity of demand with respect to the effective price is large, but this effective price is neither observable nor within the control of the museum (which can only exercise control over the entrance fee). The admission price-elasticity is a vitally important piece of information. Denoting the admission price by \( p \) and the total number of visits by \( V \), the own-price elasticity of demand, \( \eta \), is defined by \( \eta = -(p/V)(dV/dp) \). Now denoting total revenue by \( TR = pV \), and differentiating \( TR \) with respect to price yields: \(^3\)

\[
\frac{dTR}{dp} = V + p\frac{dV}{dp} = V[1 - \eta]
\]

Thus \( \eta < 1 \) implies \( dTR/dp > 0 \); i.e. if demand is price-inelastic then as the price rises total admission revenue also rises (because the proportionate fall in the number of visits is less than the proportionate rise in price which induced it). Since demand is always constrained by the total of consumers’ income, a price inelastic demand curve is only likely within a finite range of prices, and it is probable that there is some price beyond which demand is zero; it is merely assumed here that demand is price inelastic in the range of observable prices. \(^4\) Within that range of prices, since total revenue is increasing in price, the revenue-maximising position is at the highest price chargeable. Moreover, it is reasonable to think that as the number of visits falls, the total cost of the museum either remains constant (the zero marginal cost case) or falls (the positive marginal cost case); hence the profit-maximising position is also at the highest price chargeable. Since this implies a small number of visits, there is a conflict between revenue and access. This conflict is the focus of this paper. Suppose the museum, in negotiation with interested parties, \(^5\) determines two targets: a minimum number of visits, \( V_0 \), and a minimum revenue, \( TR_0 \). \(^6\)

Figure 1 sketches demand and total revenue against price. Since quantity demanded declines with price, the visit function is negatively sloped and, for an inelastic demand curve, the total revenue curve, as has been argued and demonstrated above, is increasing in price. \(^7\)

Referring to Figure 1, drawn for a price-inelastic demand, these two goals imply that, to achieve a minimum number of visits, \( V_0 \), it is necessary that the price, \( p \), is no greater than \( p_0 \); further, to achieve a minimum revenue of \( TR_0 \), it is necessary that \( p \) is at least \( p_1 \). These two targets together imply that the price should be chosen so that both \( p \leq p_0 \) and \( p \geq p_1 \), i.e. for a solution to exist it is necessary and sufficient that \( p_1 \leq p_0 \). Figure 1 is drawn with \( p_1 \leq p_0 \) and a solution, though indeterminate, exists. It is not, however, possible to set a unique price: more revenue may be earned, and fewer visits attracted, the closer \( p \) is to \( p_0 \), while the closer \( p \) is to \( p_1 \) the greater the number of visits and the lower is revenue.