The effects of the Dutch museum pass on museum visits and museum revenues

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#### Abstract

The Dutch museum pass gives unlimited access for a year to most major Dutch museums and around the half of all Dutch museums for a fixed fee. The fee revenues are distributed among participating museums in proportion to the amount of visits by pass holders and their ticket prices. In this paper, it is researched whether the museum pass increases the number of museum visits and whether it leads to higher revenues of participating museums. For this, an econometric count model of museum visits is used. The model accounts for different characteristics of museum visitors with and without a museum pass as well as for the endogenous relationship between museum visits and the ownership of a museum pass. It is found that owners of a museum pass visit a museum three times as much as they would have done when they would not own a museum pass. We estimate that in 2012 , the 900,000 owners of a museum pass made 3.4 million additional visits to participating museums because of the museum pass. In addition, these additional visitors spent money in their cafés and museum shops. Consequently, museums earned an estimated $€ 26.6$ million more by participating in the museum pass.


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## 1 Introduction

The Dutch museum pass gives unlimited access for a year to 400 Dutch museums for a fixed fee. Participating museums include large museums such as the Rijksmuseum, Van Gogh Museum and the Anne Frank House, as well as small museums. The pass was started in 1981, replacing many discount passes from individual museums. The main goals of the Dutch museum pass are to increase the number of (repeat) visits to museums and to strengthen the bond between museums and visitors. The pass gives visitors flexibility in museum visits, as pass holders can get quick entry in museums, because at most large participating museums they can get quick admission as they can skip the general waiting line. The museum pass was sold for a fixed fee of $€ 39.95$ at the beginning of 2012 (children and adolescents $€ 19.95$ ). There were 0.9 million pass holders who made on average 5.6 museums visits using their pass. 'Pass visits' account for $25 \%$ of total visits to the participating museums. Pass revenues are redistributed to participating museum in proportion to the number of free visits by pass holders. Participating museums received about $65 \%$ of the normal entrance fee for these visits.

To our knowledge, there is only one other national pass in Europe: the Swiss Museum Pass. This pass has a smaller client base of about 50,000 pass holders and a higher price ( 155 CHF , about $€$ 125). There are, however, regional passes which sometimes cross borders. An example is a threecountry museum pass in the border regions of Germany, Switzerland and France. (price for locals $€ 73$, client base 32,000 , for tourists $€ 26$, client base 15.000 ). In addition, there are city passes in e.g. Paris, Berlin and Venice. These passes usually aim at tourists, having a limited time span for free visits.

Most scientific literature considering the effect of museum entrance prices on museum visits has tackled the question whether museums should have free entrance or not. Examples are Bailey and Falconer (1998), O’Hagan (1995), Dickenson (1993) and Prieto-Rodriguez and Fernandez-Blanco (2006). This discussion is mainly about accessibility of museums, as it is discussed whether charging entrance fees makes museums even less attractive for the large part of the population that does not like to visit museums. Meanwhile, free access to museums implies that a larger charge of museum costs have to be paid by taxpayers, whereas museum visitors originate mostly from the wealthier part of the population. Recently, Frey and Steiner (2012) have suggested that museums should use a "pay as you go" pricing strategy where exit prices reflect the time spent in a museum. It is known that the demand for museum services is price inelastic (Luksetich and Partridge, 1997). Goudriaan et al. (2008) estimate a price elasticity of -0.18 for Dutch museums, which means that the demand lowers with 1.8 percent when admission prices increase with 10 percent. Goudriaan et al. (2002) and Goudriaan and Visscher (2006) estimate that Dutch museum visits would increase by 30 percent if all museums would have free entrance. This estimate is based on cases studies in France and Britain. The costs for society would however be large, as museums would then be fully tax funded. They also point out that entrance fees are on average just 25 percent of the total costs of a museum visit, as travelling costs are substantial. This holds however mostly for international tourists who have large travelling costs. Dutch Museum Pass holders are mostly from the Netherlands itself and mostly visit museums that are relatively close to their home.

Berkhout et al. (2000) estimated the effect of the Dutch museum pass on museum visits before. They found that museum pass holders in 1998 visited museums 34 percent more than they would have without a museum pass. There are however large institutional differences, as in 1998 most museum pass holders got their pass free with their bank account ( 3.9 million people) or with their train pass ( 0.7 million people), whereas only 160 thousand people bought a museum pass. Nowadays, free museum passes with a bank account or a train pass do not exist anymore, so all 900 thousand museum pass owners deliberately bought the museum pass. Therefore, it is expected that the effect of the museum pass on museum visits is larger now.

Frey and Meier (2006) modelled the finances of museums. They translated a model of Throsby (1994) for the behaviour of performing arts firms to museums. In this model, museums are assumed to be utility maximizing with respect to the number of visitors and the quality of exhibitions. In this model museums gain revenues from entrance fees, donations and grants, and from ancillary goods like the museum shop, restaurant and café. The entrances fees and the revenue from ancillary goods depend on the number of visitors. They claim that museums typically have a cost structure of high fixed costs while marginal costs are close to zero. Bailey and Falconer (1998) argued that these marginal costs are only close to zero in the short run when a museum is not operating at full capacity. Otherwise, costs have to be made to accommodate for extra visitors.

Furthermore, several game theorists have analysed the problem of how to allocate museum pass revenues between participating museums. This problem is called the museum pass game and has first been described by Ginsburgh and Zang $(2001,2003)$. Casas-Méndez et al. $(2011,2013)$ and Wang (2011) have done further research in this topic. These articles claim that distribution of the museum pass revenues by revenue loss sharing is not optimal, as it might encourage museums to raise their entrances fees to generate higher revenue. This might theoretically lead to museums that can improve their position by opting out of the museum pass. The Dutch museum pass however uses a revenue loss sharing distribution of the pass income, and in practice there has not been a museum in the last 10 years that left the museum pass program. On the contrary, the number of participating museums is rising steadily. Therefore, the theoretical museum pass problem does not seem to be an empirical problem.

In this paper, we aim to contribute to the literature by looking at empirical effects of a national museum pass, applying econometric methods to revealed preference data. Given the existence of city- or region-level museum passes in several countries, this provides indications of opportunities to expand such passes to the national level or of introducing a national pass. The paper answers two questions: Does the Dutch museum pass increase the number of museum visits? And: Do the revenues of participating museums increase because of the pass? These questions are relevant from both a cultural and an economic perspective. In a cultural perspective, it is considered beneficial for people to increase their cultural experience, for instance by visiting museums more often. From an economic perspective, the revenues for museums are very relevant, as structural challenges for the financial management of museums exist (Lindqvist, 2012). These perspectives are linked, especially in the long run. If people visit museums more often, they will in all likelihood influence others (including their children) to visit museums more often in the future, which will among other things increase museum revenues. And the other way round, if museums receive higher revenues they may be able to expand or improve their collections, increasing their cultural value.

## 2 Model

The calculation of the effects of the museum pass is inspired by the financial part of the model of Throsby (1994) for the behaviour of performing arts firms that Frey and Meier (2006) applied to museums. In our model museums gain revenues from entrance fees and from ancillary goods like the museum shop, restaurant and café. The entrance fees and the revenues from ancillary goods depend on the number of visitors. We model the number of visits a person makes to a museum as:
$n_{i j}=f\left(d_{i}, p_{j}, x_{i}, z_{j}\right)$

Where:
$n_{i j}=$ number of visits of individual $i$ to museum $j$
$d_{i}=1$ if individual i owns a museum pass, otherwise 0
$p_{j}=$ full entrance fee of museum j
$x_{i}=$ vector of individual characteristics (age, education etcetera).
$z_{j}=$ vector of museum characteristics

In the empirical analysis below, we use data on the number of museum visits by individuals in one year. Within this year, we assume that the full entrance fees $p_{j}$ and the museum characteristics $Z_{j}$ are fixed. We investigate the effects of the museum pass $\left(d_{i}\right)$ on museum visits and museum revenues, controlling for individual characteristics $x_{i}$.

Museums typically have high fixed costs while marginal costs are close to zero (Frey and Meier, 2006). Marginal costs are only close to zero in the short run when a museum is not operating at full capacity (Bailey and Falconer, 1998). As we analyse short-term effects and assume that the participating museums indeed do not operate at full capacity, the marginal costs of extra visitors are assumed to be zero in our model. However, there are indirect costs of the museum pass in the form of lost revenue, as - in the absence of a museum pass - a part of the museum pass holders would have visited the museum while paying the full entrance price. The net effect on the revenues an individual museum $j$ receives is:
$R_{j}=\sum_{i \in H} \alpha \cdot p_{j} \cdot n_{i j}-\sum_{i \in H} p_{j} \cdot n_{b, i j}$

Where:
$R_{j}=$ change in entrance fee related revenues caused by the museum pass (excluding revenues from ancillary goods and services such as café, restaurant and shop revenues)
$H=$ collection of museum pass holders
$\alpha=$ percentage of the full entrance fee paid by the museum pass organization
$n_{b, i j}=$ baseline number of visits pass individual $i$ would have made to museum $j$ if the museum pass had not existed.

The factor $\alpha$ is defined as
$\alpha=\frac{N_{m c} p_{m c}}{\sum_{j} \sum_{i \in H} p_{j} \cdot n_{i j}}$

Where:
$N_{m c}=$ number of museum pass holders
$p_{m c}=$ price of the museum pass

As museum visits by pass holders $n_{i j}$, museum prices $p_{j}$ and museum pass sales $N_{m c} p_{m c}$ are known, the effect of the museum pass on entrance fee related revenues can be computed by estimating $n_{b, i j}$, the number of baseline visits pass holders would have made to museum $j$ in the absence of a museum pass.

In the calculation of the revenue from ancillary goods and services, the marginal costs of the extra sales of ancillary goods to museum pass visitors are not assumed to be zero, as the purchase price for the museums of the ancillary goods may be substantial. To take account of this, the average profit margin of museums regarding its shop, restaurant and café is incorporated in the revenue estimate. We model the extra profit on ancillary goods and services as:
$A_{j}=\sum_{i \in H} m_{c a f e, j} \cdot r_{c a f e, j} \cdot\left(n_{i j}-n_{b, i j}\right)+\sum_{i \in H} m_{\text {shop }, j} \cdot r_{\text {shop }, j} \cdot\left(n_{i j}-n_{b, i j}\right)$
(4)

Where:
$A_{j}=$ change in revenues from ancillary goods and services caused by the museum pass
$r_{c a f e, i}=$ the average café revenue per museum visit (including visits where the café is not visited),
$m_{c a f e, j}=$ average profit margin of the café as a share of café revenues
$r_{\text {shop }, i}=$ average shop revenue per museum visit (including visits where the shop is not visited).
$m_{\text {shop }, j}=$ average profit margin of the shop as a share of shop revenues

We assume that museum pass visitors spend as much on ancillary goods when visiting a museum with a museum pass, as they would do if the museum pass would not exist. Also, as only a minority of the relevant museums have their own restaurant, restaurant revenues have not been taken into account. Furthermore, it is assumed that the shops and cafés do not operate at full capacity, so there are no extra personnel costs. The profit margins are based on the results of a survey among museums on the revenues and costs of museum shops and cafés.

Furthermore, museums get a commission for museum passes sold in their museum. The total revenue of the museum pass for a museum is:
$T_{j}=R_{j}+A_{j}+F_{j}$

Where:
$T_{j}=$ revenue of the museum pass for a museum
$F_{j}=$ commission on sales of museum passes in the museum

## 3 Estimation method

The estimation of the number of museum visits that museum pass holders would have made without the museum pass has several complexities. First, there is an endogenous relationship between owning a museum pass and the number of museum visits. People who derive more utility from visiting a museum may also have a higher propensity to purchase a museum pass. The effect of the possession of a museum pass on museum visits is therefore endogenous and cannot be estimated with a simple regression model. Second, the outcome variable is an integer, so a count model is needed. As the mean and the mode of the number of museum visits are not equal, a standard Poisson count model is not suitable, as it assumes the mean and modus to be equal. The Negative Binomial (type 2)-model is used because it does not need this assumption to hold. Third, it is possible for potential museum pass buyers to get free or reduced fee access to museums for being aged 65 or higher, being a student or, in several municipalities including Amsterdam, having a low income. Potential museum pass buyers who get a discount on museum entrance fees could be less inclined to buy a museum pass.

To take into account of these complexities, we estimated a multinomial endogenous treatment model with a Negative Binomial (type 2)-distributed outcome variable (by Deb and Trivedi, 2006). Maximum likelihood optimisation is used to estimate the parameters. For this estimation, the MTREATREG-command of Stata (Deb, 2009) is used. Two endogenous treatment options are used, the possession of the museum pass and the possession of another type of discount pass. Several control variables have been used in the estimation of the equation for the probability of possessing a museum pass (or another discount pass): gender, age (in 5-year categories), region (in 40 categories), household income (in eight categories), highest level of education (in six categories), highest level of education of parents (in six categories) and a dummy for students. For the estimation of the number of museum visits, the same control variables have been used. Exceptions are household income and the dummy for students, as they are primarily indicators of reasons to possess another type of discount pass and not of the willingness to visit a museum. Household income and the indicator for students are used as an instrument in this estimation.

## 4 Data

Two main sources of information have been used: a survey among museum visitors and administrative data about pass holders and their museum visits. In the visitor survey, a representative sample of the Dutch population of at least 16 years old was interviewed. Of this sample, a selection has been included in the analysis. These are people who visited at least one Dutch museum in the last three years. That means that the results cannot be generalized across the whole Dutch population, but can be generalized across the part of the population that visits at least a museum once every three years. Weights have been calculated based on gender, age and region based on the full sample. 300 out of the 2,070 respondents possessed a museum pass. The respondents were interviewed about their museum visits in 2012 and their spending in museum cafés and shops. The survey was carried out in May 2013.

The administrative data contains background information on the pass holders such as age, gender, purchase date and address. Furthermore, these data contain every museum visit of the pass holders in 2012. As the administrative data only contain information on museum visits of museum pass holders, they cannot be used to estimate the effect of the museum pass on museum visits. These data do however provide vital background information to check the validity of the survey results. According to the survey results presented in Table 1, respondents visited a Dutch museum on average 2.2 times in 2012. Museum pass holders said that they visited 6.2 museums on average. We know from the administrative data that the average number of visits with a museum pass of this group was in reality 5.8 times in 2012. This shows that the survey results are fairly reliable. Museum visitors who were eligible for another type of discount went to a museum 2.4 times on average, while museum visitors without a discount went to a museum 1.3 times. 16 respondents $(0.7 \%$ of the respondents) visited a museum more than 20 times in 2012 of whom 11 owned a museum pass. If these extreme cases are omitted in the sample, the average number of museum visits of museum pass holders falls to 5.2. When the extreme cases are omitted in the administrative data, the average number of museum visits of museum pass holders reduces to 4.7. As this paper focuses on the effect of the museum pass on regular museum visitors, not on extreme cases, persons who made more than 20 museums visits in 2012 are omitted.

Table 1 Museum visits by type of visitor

| Type of museum visitor | Average museum visits <br> in last 12 months | Number of <br> observations | Average museum <br> visits in last 12 <br> months (if < 20) | Number of <br> observations |
| :--- | :---: | :---: | :---: | :---: |
| Museum pass holder | 6.2 | 300 | 5.2 | 291 |
| Holder of other type of <br> discount pass | 2.4 | 348 | 2.1 | 344 |
| Other visitors | 1.3 | 1422 | 1.3 | 1419 |
| Total | $\mathbf{2 . 2}$ | $\mathbf{2 0 7 0}$ | $\mathbf{2 . 0}$ | $\mathbf{2 0 5 4}$ |

## 5 Results

## Museum visits

The full estimation results are presented in Table 2. These are both the estimation results of the multinomial logit equation estimating the probability of owning a museum pass or other type of discount pass, and the count model explaining the total number of museum visits. The results show that students and low-income respondents have a larger probability of possessing another type of discount pass. Furthermore, older people, high-income people, highly educated people and people with highly educated parents more often possess a museum pass. As these characteristics are commonly seen as drivers for cultural participation, these results are as expected.

The possession of a museum pass has a positive and significant effect on the number of museum visits, taking account of differences in individual background characteristics. From these results we computed that museum pass holders make 3.0 times as many museum visits than in case they would not have possessed a discount pass. 3.0 is the exponent of the estimated coefficient of 1.101. The $95 \%$-confidence interval of this ratio is 2.1 to 4.3 . Other characteristics which strongly influence the number of museum visits are the visitors' age, education level and region. Possession of other types of discount passes does not have a significant influence on museum visits, whereas the uncorrected results in Table 1 show that they visit a museum 1.6 as often as museum visitors without a discount do. All of this difference can be explained by differences in background characteristics.

Table 2 Estimation results

|  | Effect on museum visits | Effect on probability of owning the museum pass | Effect on probability of owning other type of discount pass |
| :---: | :---: | :---: | :---: |
| ```Discount pass: museum pass (reference: no discount pass)``` | 1.101*** |  |  |
| other type of discount pass | -0.051 |  |  |
| Female (reference: male) | 0.096** | 0.097 | -0.036 |
| Age: 20-24 (reference: 15-19) | -0.056 | -1.293** | -0.954*** |
| 25-29 | -0.475*** | -1.847** | -1.768*** |
| 30-34 | -0.429*** | -0.630 | -1.687*** |
| 35-39 | -0.198 | -0.895 | -1.504*** |
| 40-44 | -0.257** | -1.021 | -1.615*** |
| 45-49 | -0.161 | -0.847 | -1.513*** |
| 50-54 | -0.226* | -1.110* | -1.714*** |
| 55-59 | -0.169 | -0.693 | -2.435*** |
| 60-64 | -0.058 | 0.536 | -1.412*** |
| 65-69 | -0.084 | 0.618 | -0.958** |
| 70-89 | 0.152 | 1.051 | -1.123** |
| Type of Household: <br> with partner without children (reference: | -0.021 | -0.695*** | 0.105 |


|  | Effect on museum visits | Effect on probability of owning the museum pass | Effect on probability of owning other type of discount pass |
| :---: | :---: | :---: | :---: |
| with partner and children | -0.049 | -0.654** | 0.233 |
| single with children | -0.118 | -0.441 | 0.189 |
| other | 0.116 | -0.207 | -0.083 |
| Gross household income per year: <br> € 12.500 - $€ 20.000$ (reference: < € 12.500) |  | 1.045* | 0.137 |
| € 20.000-€ 26.200 |  | 0.869 | -0.193 |
| € 26.200-€ 32.500 |  | 1.146** | -0.269 |
| € 32.500-€ 38.800 |  | 1.172** | -0.671* |
| € 38.800-€ 51.300 |  | 0.808 | -0.749* |
| € 51.300-€ 65.000 |  | 0.983* | -0.473 |
| > € 65.000 |  | 1.718*** | -0.419 |
| won't say |  | 1.180** | -0.378 |
| Education level: higher professional (reference: university) | 0.03 | 0.011 | 0.222 |
| senior general secondary / pre-university | -0.086 | -0.825** | 0.417 |
| secondary vocational | -0.233*** | -0.993*** | 0.026 |
| pre-vocational | -0.173* | -0.811** | 0.552 |
| lower pre-vocational | -0.309** | -0.655 | 0.198 |
| won't say | 0.095 | 0.839 | 0.487 |
| Highest education level parents: higher professional (reference: university) | 0.014 | -0.896*** | -0.166 |
| senior general secondary / pre-university | -0.040 | -0.847** | -0.601* |
| secondary vocational | -0.075 | -1.013*** | -0.303 |
| pre-vocational | -0.055 | -0.728** | -0.445 |
| lower pre-vocational | -0.127 | -0.943*** | -0.788** |
| won't say | -0.148 | -1.504*** | -0.667** |
| Students (reference: non-students) |  | -0.368 | 0.661** |
| Constant | 0.431* | -0.922 | -0.093 |
| Dummies for 40 regions | included | included | included |
| Number of observations | 2052 |  |  |

Based on the estimation results and the fact that museum pass holders made 5.0 million museum visits in 2012, we estimate that pass holders would have made 1.7 ( $=5.0$ million visits/3.0) million visits if the museum pass would not have existed. This implies that 18 percent of the 20 million museum visits per year in the Netherlands are made because of the existence of the museum pass.

## Financial effects for museums

Using the results of the previous analyses, an average entrance fee of $€ 9.16$ and a benefit percentage of $65 \%$, the total extra entrance fee related revenues from the museum pass are $€ 13.2$ million in 2012. Furthermore, the total provision was $€ 0.7$ million. The extra profits from ancillary goods are estimated to be $€ 7.5$ million from the cafés and $€ 5.2$ million from the museum shops. This is based on an estimated average profit margin on revenues of $54 \%$ for museum shops and a profit margin on revenues of $50 \%$ for cafés. As these numbers are weighted by museum visits, the profit margins of the large museums (with large shops and cafés) are dominant. These figures are based on the survey among museums. These margins are comparable to the margins used in other literature, which are typically around $40 \%$ for museum shops with paid staff and around $50 \%$ for shops with volunteer staff ${ }^{1}$. As we assume that the marginal personnel costs are zero, our estimated margins are in line with these used in the literature. The average consumption in the shop for visits with a museum pass is $€ 2.88$ and the average consumption in the museum café is $€ 4.40$. These figures are based on the questionnaire among museum visitors where visitors were asked to recall their spending on ancillary goods during their last museum visits.

This leads to total benefits of $€ 26.6$ million which have to be divided between the 388 participating museums. As the museums that accept the museum pass range from the 'superstar' class (Frey and Meier, 2006) with more than 1 million visitors per year to very small museums with less than 5000 visitors, the financial effect is not equal between museums. The 10 participating museums with the highest revenues from the museum pass together generate $39 \%$ of the additional benefits, whereas the 100 smallest museums together generate $0.35 \%$. However, the average contribution of around $€ 1000$ for a small museum can still be substantial for their finances as the typical budget of such a museum is also very limited.

To check the robustness of the results, the revenues are also calculated with conservative estimates of the parameters. In this sensitivity analysis, the lower bound of the confidence interval of the effect of the museum pass on museum visits of 2.1 instead of 3.0 is used (which leads to 2.4 million baseline visits) is used. Also, the profit margin for the museum shop and the museum café is set to a low value of $40 \%$. This still yields a positive financial effect: $€ 15.0$ million, of which $€ 6.6$ million can be attributed to the entrance fees. So even without the extra sales of ancillary goods and services, the museum pass is on average profitable for participating museums. We note that this needs not be the case for every individual museum.

[^1]
## 6 Conclusion and discussion

Econometric analysis of museum visits shows strong benefits from the national museum pass in the Netherlands, both in terms of financial returns to museums and the total number of museum visits. The analysis explains both pass holdership and museum visits using control variables, and taking account of endogeneity of pass holdership. Without the museum pass, the total number of museum visits would be $18 \%$ lower as museum pass holders visit a museum three times more often because of the museum pass. There is also a substantial positive financial effect for the participating museums in both revenues of the museum pass income as well as the additional sales of ancillary goods and services.

The main limitation of the analysis is that we cannot be sure that all relevant control variables have been included in the analysis. Even controlling for gender, age, household type, region, household income, education level, parents' education level and students, it is still possible that there are remaining differences between people who often visit museums and people who do not. If these differences are positively correlated with both museum visits and pass holdership, the analysis may overestimate the true effect of the pass. On the other hand, it may be that non-included factors may not be correlated with both pass holdership and museum visits. To test for this, a (quasi) experiment would be needed.

An important question is whether a national museum pass would also be beneficial for museums in other countries. Possibly, the success of the Dutch museum pass is related to a high population density and a large number of museums within a reasonable travel distance. Moreover, both people and museums are concentrated in the western part of the Netherlands, facilitating visits. However, other countries (e.g. Belgium, England), or large urbanised regions within these countries (e.g. the Berlin and Paris regions), are sometimes comparably densely populated and endowed with museums as (the western part of) the Netherlands.

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[^0]:    Disclaimer: This is a discussion paper, not a completed research report. The content of the paper is not final and may be amended on the basis of discussions and developing insights.

[^1]:    ${ }^{1}$ The British Association of Independent Museums has published a retail guideline for small museums. They claim that it is normal for a museum shop to have on average $45 \%$ gross profit (Prescott, 2003). Kirk (2005) claims that museum shops operating paid staff should have a profit margin around $35-40 \%$ and museums shops operating volunteer staff have a profit margin around 45 to $55 \%$.

