An empirical reconstruction of the attractiveness of Italian museums♠

(preliminary version)

Guido Candela
Antonello E. Scorcu
Laura Vici

Department of Economics
and
Center for Advanced Studies on Tourism

University of Bologna

Abstract: This paper investigates the attractiveness of a sample of Italian museums in terms of number of admissions. The empirical evidence suggests the centrality of the artistic values of the collection and of the city where the museum is located. Ancillary services, except bookshops, do not exert any significant effect on the flow of admissions. The results are robust to a series of different specifications.

1.Introduction

Nowadays museums are gaining wider and wider audiences. The increased demand of museum services, driven by the secular rise of education levels and of per capita wealth and by the interest for something authentic rather than digital copies, have changed the way museums and collections are perceived.

The increasing socio-cultural and economic relevance of museums has been the subject of several analyses. In most empirical and policy investigations, a positive effect is taken for granted and/or without disentangling the various components of the ñproduct museumò. Among the several indicators of the activity of a museum, the number of admissions is one of the most commonly used. The museum is considered as a catalyst of tourist flows (even at the risks of emphasizing only

♠ G. Candela: Department of Economics, Piazza Scaravilli 2, I-40129 Bologna, Italy. guido.candela@unibo.it; A.E. Scorcu: Department of Economics, Strada Maggiore 45, I-40126 Bologna, Italy. antonello.scorcu@unibo.it; L. Vici: Department of Economics, Strada Maggiore 45, I-40126 Bologna, Italy laura.vici@unibo.it. The authors wish to thank R. Cellini, F. Dallari and S. Giannerini for their helpful suggestions on a previous version of the paper. All remaining errors are ours.

the entertainment side of the museums). A larger number of admissions is associated to higher revenues for the museum and for the area where the museum is located.

In general, the admissions to a museum depend on the type and quality of its collection, on its location (in a large, culture-rich, easy-to-reach city, or in a small, peripheral town without other tourist attractions) and on macroeconomic variables. Also facilities and ancillary services (that range from the traditional audio-guides or guided tours, to the decor and cleanliness of the building, the strategy of presentation of the collection, the development of an intriguing website, an efficient reservation system, the existence of bars, restaurants and bookstores)that precede, accompany and follow the visit might increase the attractiveness of a museum (possibly in terms of admissions)[1].

However, many of these characteristics, like the overall artistic relevance of the collection, often are not amenable to immediate measurement[2]. From a policy perspective, this is an unsatisfactory situation, as it does not allow for the identification of strategies aimed at increasing the value of the museum, that goes hand in hand with the conservative approach often adopted by the managers of museums.

In this paper, we model the determinants of the attractiveness of a sample of Italian museums. The artistic relevance of the collections of museums and the importance of some of their ancillary services are explicitly graded. The empirical evidence suggests that the artistic importance of the collection and of the city where the museum is located exert a relevant influence on admissions whereas ancillary facilities, with the notable exception of the museum bookshop, are of limited importance in increasing the number of admissions to the museum[3].

The work is divided into five sections. After this brief introduction, section 2 discusses the theoretical approach. The data set is described in section 3 and the empirical evidence is presented in section 4. Section 5 summarizes the results and concludes.

2. The theoretical approach

The attractiveness of a museum is a complex and often elusive concept. Attractiveness has many facets (referred to the museum as a whole, to its collection, to the visit or to other services and facilities attached to the visit) that can be evaluated through ad hoc surveys on specific case studies.

[1] Jaffry and Apostolakis, 2011 analyze the preferences of the British Museum in London.

[2] Particularly in Italy, the law, regulations, financial constraints as well as cultural habits impede a dynamic management of a museum. Hence, in the evaluation of the attractiveness of a museum, its collection can be considered like a fixed effect.

[3] Among the ancillary services, bookshop is the facility more closely connected to the artistic relevance of the collection.

However, because of the case specific nature of these exercises, any reliable comparative assessment of the attractiveness of different museums remains difficult to obtain[4].

The sectional analysis developed in this paper estimates the degree of attraction of a museum (expressed by the number of visitors per year) in terms of measurable (and widely agreed) proxies of the artistic relevance of its collection and of the city where the museum is located. Another series of variables measures the ancillary characteristics of the visit to the museum. Also these characteristics are measured through the evaluation of experts' judgments. Our analysis rests therefore on the maintained assumption that these experts' grades are relevant also for ordinary visitors. The other socio-economic characteristics and cultural *milieu* of the city are summarized by a provincial dummy variable, whereas the macroeconomic conditions are summarized by a series of time dummies.

In formal terms, in a given year, the number of visitors of museum *i* located in city *j*, Adm_{ij}, is regressed against a proxy for the artistic importance of the museum collection, Mus_i; the artistic importance of the city *j*, $City_j$; the size of the local basin of attraction, proxied by the regional population size (in log), Pop_h; a series of v ancillary characteristics, Anc^v_{ij}; a series of *t* time dummies, $Time_t$, and a series of *p* provincial dummies indicating the location of the museum *i*, $Prov_p$. Hence, if two or more museums are located in the same province, the corresponding dummy measures the provincial attractiveness with respect to the sample average. If more than one observation refer to a given year, it is possible to estimate the structural time effect of that year.

As the visits of the expert (and the consequent evaluation) were distributed over the interval 2005-2011, the admissions and the regional population are referred to the year of the visit. However, except for the time dummies, no other time effect is present and therefore the time index in Adm_{ij} and Pop_h has been suppressed. The resulting sectional regression which constitutes our general framework is therefore:

$$Adm_{ij} = a_0 + a_1 Mus_i + a_2 City_j + a_3 Pop_h + \Sigma_v a_v Anc^v_i + \Sigma_t a_t Time_t + \Sigma_p a_p Prov_p + u_{ij} \qquad [1]$$

where u_{ij} is a white noise error. Because of the limited size of the sample, and the large number of provincial and annual fixed effects, we cannot estimate the time and the provincial dummies contemporaneously. Hence, we implement our estimation strategy considering only one series of dummies at once in the specifications [1].

[4] Cf., among others, Castellani *et al.*, 2014, Choi *et al.*, 2010, Bedate *et al.*, 2009, Brida *et al.*, 2011 and Skinner, 2006. Bedate et at. , 2009, and Jaffry and Apostolakis, 2011 use the discrete choice modeling to estimate the preference structure of visitors (and sometimes non visitors) of a museum. These studies differ in terms of the (museum-specific) alternatives proposed to visitors and several other characteristics.

3. The data set

Our (non random) sample is composed of 65 Italian museums. For each museum included in the sample we are able to grade the artistic importance of its collection and of the city where is located and its ancillary facilities as well.

The first two set of grades, denoted with *Mus*, and *City*, are from the site of the Italian Touring Club (TCI), a well known, respected NGO whose aim is the valorization of the Italian artistic, cultural and natural attractions[5]. The TCI evaluation follows a Likert scale ranging from 0 to 2, a grade awarded only to the most important monuments, museums, sites and cities.

The evaluations of the ancillary facilities of the museums have been published on the specialized monthly magazine *Il Giornale dell'Arte*[6]. These grades range from 0 to 10, and evaluate the pleasantness, the originality and functionality of the venue, *Anc_ven*; the ease of access, especially for disabled people, *Anc_acc*; the state of maintenance and cleanliness of the building, *Anc_cln*; the availability and professionalism of the wardens, *Anc_wrd*; the (technical) visibility of the exhibition, *Anc_vis*; the functionality of the lighting in the presentation of the collection; *Anc_lgt*. We consider also some other features, like as the degree of decorum of the lavatories, *Anc_lav*; the existence of the museum bookshop, *Anc_bks*, and the availability of elevators that would facilitate the visit, *Anc_lft*[7].

A further potentially important feature in determining the attractiveness of the museum is the ñlocalò basin of attraction of the museum, proxied by the (log) population of the region where the museum is located, *Pop*; the figures are provided by the Italian Statistical Office, ISTAT.

Other explanatory variables describe the institutional setting of the museum, distinguishing between state, municipal, and private foundations. The number of visitors of a museum can be influenced by the inclusion of the city in the UNESCO list of World Heritage Sites; a dummy variable identifies this case. These variables, however, are never statistically significant in the following econometric exercise[8].

A series of time dummy variables, *Time*, takes into account the yearly time effects due to changes in macroeconomic/aggregate conditions. These variables can also neutralize any possible (but unlikely) time dependence effect in the degrees of the expert evaluation. Another series of

[5] The information about the grades are drawn from the site http://www.touringclub.com/nazione/italia.aspx.

[6] The grades are given by an expert since 2005; the international edition of the magazine, the Art Newspaper, does not publish these evaluations.

[7] In those few cases where there is no grade for some ancillary variables, we input the average value of that variable computed over available observations. We drop the evaluations about coffee shops and restaurants as in many cases these grades are lacking.

[8] On this line, Cellini, 2011. See also Pauelli *et al.*, 2013.

dummies, *Prov*, proxied the provincial fixed territorial effects, as only certain areas are vocated to cultural tourism, because of the spatial concentration of museums, monuments and sites. In some cases two or more museums of our sample are located in one province. This is the case of Rome, Milan, Naples, Turin, Venice and Florence or of some others minor cities characterized by a significant cultural heritage, like Arezzo or Ravenna. In these cases the dummy variable measures the average attractiveness of the province, whereas in the cases of one museum in one province pair, the attractiveness of the museum becomes indistinguishable from that of the area.

The attractiveness of a museum is measured by the number of admissions[9]. We consider three different admission variables, in logs: i) the number of admissions in the calendar year in which the ancillary services of the museum are evaluated, *Adm_yea*; ii) in order to reduce the effect of any possible idiosyncratic shock which could occur in specific years for specific museums, we consider also the average flow of admissions computed over the period 2005-11, or over shorter interval, depending on the actual data availability for each museum, *Adm_ave*; iii) the yearly average flow of admissions computed over the longest possible interval up to the year of the expertôs evaluation, *Adm_pre*.

In Table 1 we report some descriptive statistics (mean, standard deviation, minimum and maximum) for each variable.

The mean values of the three admissions variables considered are similar, ranging from 160000 to 170000 visitors per year, and exhibit a very strong correlation, even if they reflect quite different concepts. It is immediately apparent that our sample comprises small museums, with less than 10 thousand visitors per year, and also superstars like the Uffizi in Florence, with more than one million and half visitors per year.

As for the ancillary services, on average, the highest evaluations is reached by the venue and the lowest by the museum bookshop, also in this case each variable has a quite large variability. The correlation coefficients between this group of variables are always positive, but in several cases are not significant and, except in a few cases, of moderate size, suggesting some form of complementarity in the provision of these services[10].

The artistic importance of the museum (*Mus*) and of the city where the museum is located (*City*) ranges from zero to two. The average value of the former variable is 0.92, much lower than the average value of the latter, 1.65. The correlation between these *Mus* and *City* is positive and significant, but equal to 0.33.

[9] Data on admissions are collected and published for government owned and managed museums. For private museums or museums run by public local authorities (municipalities in most of the cases), data collection is not always systematic and/or publicly available.The figures refer to the overall admissions, irrespective of the ticket charged.

[10] Correlation coefficients are reported in the Appendix.

Table 1 ï Descriptive statistics

		Obs	Mean	Std. Dev.	Min	Max
Adm_ave	Admissions, yearly average	65	167320	262615	9000	1589326
Adm_pre	Admissions, yearly av. before and year of expert visit	65	162518	241652	7827	1342558
Adm_yea	Admissions, year of the expert visit	65	165452	242329	9000	1342558
Anc_acc	Museum accessibility	65	6.692	1.520	4	10
Anc_bks	Museum bookshop	65	5.877	2.625	0	10
Anc_cln	Museum cleanliness	65	7.029	1.433	4	10
Anc_lav	Museum lavatories decorum	65	6.431	2.128	0	10
Anc_lft	Availability of elevators	65	6.855	2.580	0	10
Anc_lgt	Museum lighting quality	65	6.998	1.837	3	10
Anc_ven	Originality of the venue	65	8.055	1.628	3	10
Anc_vis	Exhibition visibility	65	7.208	1.693	3	10
Anc_wdn	Availability and professionality of wardens	65	6.677	2.047	0	10
City	Artistic importance of city	65	1.646	0.623	0	2
Italy_centre	Dummy Centre Italy	65	0.400	0.494	0	1
Italy_north	Dummy North Italy	65	0.415	0.497	0	1
Italy_south	Dummy South Italy	65	0.169	0.378	0	1
Mus	Artistic importance of museum collection	65	0.923	0.835	0	2
Pop_reg	Regional population	65	4263901	2192114	591338	9917714
Prop_priv_fund	Dummy private museum	65	0.138	0.348	0	1
Prop_pub_local	Dummy local authority museum	65	0.308	0.465	0	1
Prop_pub_stat	Dummy government museum	65	0.554	0.501	0	1
Time_2005	Dummy year 2005	65	0.077	0.269	0	1
Time_2006	Dummy year 2006	65	0.169	0.378	0	1
Time_2007	Dummy year 2007	65	0.138	0.348	0	1
Time_2008	Dummy year 2008	65	0.169	0.378	0	1
Time_2009	Dummy year 2009	65	0.123	0.331	0	1
Time_2010	Dummy year 2010	65	0.138	0.348	0	1
Time_2011	Dummy year 2011	65	0.138	0.348	0	1
Time_2012	Dummy year 2012	65	0.046	0.211	0	1
Unesco	Dummy UNESCO World Heritage List	65	0.569	0.499	0	1

In more than half of the cases considered in the sample, UNESCO has awarded the city and/or its museums. Most of the museums are publicly run (more often by the central government rather than by the local authorities); only 15% of the museums are run by foundations, private bodies, the Church or other institutions.

A rough approximation of the geographical distribution of museums is given by dummies that distinguish between museums located in the North, Centre and South Italy[11], whereas at the provincial level, most of the provinces have just one observation, equal to 1.5% of the sample. Genoa, Naples and Venice provinces reach 5% of the sample, Milan and Turin 6%, Florence 8% and Rome 12%. The regional population ranges from 500,000 to 10 million inhabitants. Only 17% of the museums are located in the South of Italy, with the remaining cases evenly distributed between the North and the Centre.

[11] Sardinia and Sicily are inserted in the South Italy group.

Finally, the observations of the sample are quite evenly distributed over the 13 years considered, except for 2005 and 2012, the first and the last years of the interval.

4. The empirical evidence

In the first step of the empirical analysis, we regress the number of admissions to the museum in the year of the visit of the expert, *Adm_yea*, against a series of covariates describing the size of the local market (the regional population), the artistic attractiveness of the museum and of the city where is located (TCI grades), and the grades describing the ancillary services offered by the museum in conjunction with the visit to the collection. The dummy variables *Unesco* and those related to the property of museums (*Prop_pub_local*, *Prop_pub_stat* and *Prop_found_priv*) are irrelevant in the econometric analysis and have been excluded.

In Table 2, column 1 shows the results of our basic specification, without any time or provincial dummies. The only significant variables in this initial specification are the artistic relevance of the museum and the grade attached to the bookshop of the museum. The regression explains more than half of the overall variability of the dependent variable, there is no sign of heteroskedasticity but the link test signals a possibly inadequate specification (Pregibon, 1979).

In column 2 we add the time dummies, using the year 2012 as the base year. The evidence suggests a limited impact of these dummies: only the year 2005 is significant at the 5% level, but a F test does not reject their joint lack of significance. The inclusion of the time dummies leads to a clearly overparametrized model, and it is not surprising to see a drop in the significance of the estimated coefficients, in particular, in the museum grade variable, with only a moderate increase in the adjusted R-squared.

The same problem is magnified with the inclusion of 34 provincial dummies (column 3). The only variable which remains statistically significant is the artistic relevance of the museum. A natural refinement of the specification of column 3 suggests to discard non-significant provincial dummies. More precisely, a general to specific approach suggests to drop the least significant dummies until, in our preferred specification, shown in column 4, we retain only the provincial dummies with at least a 5% significance level. The results are similar to those of the basic specification, with some overall improvements, as the regression has no sign of misspecification or heteroskedasticity. The empirical evidence supports the case of a positive impact of the artistic relevance of the museum on admissions, with the estimated coefficient in sign and size similar to the one of column 1, and of the museum bookshop. The provincial dummies that survive to the selection procedure are those of the

three superstars among the Italian cultural tourism destinations, Rome, Florence and Venice, ordered in terms of size of the corresponding coefficients.

TABLE 2 ï Determinants of the attractiveness of the Italian Museums (I)

	(1) Baseline specification		(2) Time dumies		(3) Provincial dummies		(4) Preferred specification	
Dependent var.	Adm_yea		Adm_yea		Adm_yea		Adm_yea	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Cons	9.591***	(3.101)	9.002**	(3.711)	54.456	(31.927)	10.342***	(2.899)
Mus	0.405**	(0.185)	0.215	(0.209)	0.598**	(0.279)	0.436**	(0.171)
City	0.392	(0.248)	0.349	(0.279)	-0.306	(0.740)	0.175	(0.230)
Pop	-0.107	(0.213)	-0.197	(0.245)	-3.044	(2.174)	-0.177	(0.196)
Anc_bks	0.240***	(0.055)	0.232***	(0.060)	0.176	(0.105)	0.184***	(0.052)
Anc_ven	0.158	(0.102)	0.228	(0.110)	-0.057	(0.162)	0.130	(0.093)
Anc_acc	0.107	(0.101)	0.075	(0.103)	0.045	(0.140)	0.098	(0.093)
Anc_cln	-0.077	(0.146)	-0.107	(0.150)	0.166	(0.337)	0.085	(0.139)
Anc_wrd	-0.076	(0.072)	-0.053	(0.077)	-0.068	(0.106)	-0.070	(0.065)
Anc_vis	-0.003	(0.094)	0.069	(0.101)	0.022	(0.146)	0.020	(0.086)
Anc_lgt	0.012	(0.095)	0.063	(0.105)	-0.089	(0.169)	-0.050	(0.089)
Anc_lav	-0.007	(0.066)	-0.028	(0.068)	0.081	(0.137)	-0.006	(0.059)
Anc_lft	-0.016	(0.057)	0.038	(0.061)	0.030	(0.116)	-0.005	(0.051)
Prov_Fi							1.218	(0.461)
Prov_Rm							0.691	(0.361)
Prov_Ve							1.637	(0.550)
Number of obs.	65		65		65		65	
R-squared	0.546		0.624		0.867		0.655	
Adj R-squared	0.442		0.466		0.527		0.549	
	F(12,52)=5.22 [0.000]		F(19,45)=3.93 [0.000]		F(46,18)=2.55 [0.017]		F(25,49)=6.19 [0.000]	
Time=0			F(7,45)=1.33 [0.257]					
Prov=0					F(34,18)=1.28 [0.297]			
Breusch-Pagan het. chi2(1)	0.00 [0.974]		0.02 [.895]		5.98 [0.0145]		0.85 [0.357]	
linktest	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
_hat	-3.928	(2.488)	0.302	(1.581)	0.471	(0.918)	0.198	(1.976)
_hatsq	0.222*	(0.112)	0.031	(0.070)	0.024	(0.041)	0.035	(0.086)
_cons	27.108*	(13.731)	3.905	(8.896)	2.948	(5.137)	4.539	(11.225)

Note that the visitors cannot assess ancillary services in advance (unless they read the specialized report when planning the visit), whereas information about the relevance and quality of the collection is available to potential visitors before the visit, even not necessarily in terms of TCI grades. Hence, we expect that the artistic quality of the collection can exert a major influence on the choice of potential visitors, because of its crucial role and its predictability. In other words, in the choice process of visitors, first comes the relevance of the museum collection then, eventually, the availability (and quality) of the ancillary services.

In Table 3 we try to model this hierarchical process. We first regress the number of admissions against the main determinants, the size of the market and the artistic relevance of the museum and the city, neglecting the grades given to the ancillary services. In the second stage we regress the residuals of the first stage regression (i.e. the attractiveness left unexplained by the minimization of

the sum of the squared deviations with respect to the model with the main determinants) against the grades assigned to the ancillary variables. The results shown in Table 3 follow the same logic already discussed for Table 2. In column 1, the basic model is regressed; columns 2 and 3 augment the specification with the time and provincial dummies, respectively. The specification with the complete series of time and provincial dummies are clearly overparametrized and the coefficients are less precisely estimated, because of the low number of degrees of freedom. Column 4 shows the results of our preferred model, which retains only the provincial dummies with a significance level of 5% or below.

The results of the first stage regressions are unequivocal: the size of the market (the log of the regional population) is never significant, while the artistic grades attached to the city and to the museum are always significant in determining the (log) number of admissions, with the former variable somewhat larger in size than the latter. Note that the sum of the elasticity coefficients of these two set of grades is not statistically significantly different from one. The results of columns 1 and 4 are roughly similar ï the city effect loses some weight, but not its statistical significance, when some provincial dummies are included in the regression, whereas the museum grade coefficients are very similar in size (and also analogous to the corresponding estimate of Table 2, column 4).

In column 4, three out of four provincial dummies (Florence, Rome, Venice) are in common with the specification of Table 2, column 4. No evidence of misspecification or heteroskedasticity emerges. Also the second stage of the analysis neatly supports the previous empirical findings about the relevance of the ancillary museum services: only the bookshop grade turns out to be positive and statistically significant.

In order to assess the reliability of our results, we perform a series of robustness checks. The number of admissions in the year of the visit of the expert might be a biased overall assessment of the average degree of attractiveness of the museum, because of unknown idiosyncratic shocks. In a pure sectional analysis these positive and negative shocks are expected to neutralize each other. In addition, to *Adm_yea*, we consider also *Adm_ave*, the average yearly number of admissions over the period 2005-11 or over shorter periods in case of data non-available for the whole interval of time. The results are shown in Table 4, column 1. To facilitate the comparison, we use the same specification of Table 2, column 4. Unsurprisingly, the estimated coefficients are analogous in sign and size, the only minor difference is the drop in the significance level of the Rome provincial dummy variable.

TABLE 3 ï Determinants of the attractiveness of the Italian Museums (II)

	(1)		(2)		(3)		(4)	
FIRST STAGE	Baseline specification		Time dummies		Provincial dummies		Preferred specification	
Dependent var	Adm_yea		Adm_yea		Adm_yea		Adm_yea	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Cons	10.199***	(3.452)	12.977***	(4.310)	55.529**	(26.366)	12.044***	(3.041)
Mus	0.418**	(0.178)	0.331	(0.232)	0.425**	(0.175)	0.409**	(0.158)
City	0.675***	(0.252)	0.783***	(0.282)	0.123	(0.549)	0.475**	(0.222)
Pop	-0.030	(0.237)	-0.218	(0.289)	-3.008	(1.767)	-0.147	(0.208)
Prov_Fi							1.434***	(0.4719
Prov_Pi							-2.299***	(0.986)
Prov_Rm							0.995**	(0.387)
Prov_Ve							1.510**	(0.580)
Number of obs	65		65		65		65	
R-squared	0.247		0.307		0.779		0.483	
Adj R-squared	0.210		0.178		0.495		0.419	
	F(3,61)=6.67 [0.001]		F(10,54)=2.39 [0.020]		F(36,28)=2.74 [0.004]		F(7,57)=7.60 [0.000]	
Time=0			F(7,54)=0.67 [0.699]					
Prov=0					F(33,28)=2.040 [0.029]			
Mus + City=1	F(1,61)= 0.130 [0.723]		F(1,51)=0.13 [0.718]		F(1,28)=0.65 [0.427]		F(1,57)=0.24 [0.625]	
Breusch-Pagan het. chi2(1)	0.430 [0.513]		0.03 [0.865]		8.72 [0.003]		0.100 [0.757]	
linktest	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
_hat	-13.251*	(6.648)	-5.160	(4.786)	0.224	(1.390)	-0.829	(2.765)
_hatsq	0.647**	(0.301)	0.276	(0.214)	0.035	(0.062)	0.080	(0.121)
_cons	78.241**	(36.556)	34.215	(26.645)	4.288	(7.710)	10.389	(15.760)
SECOND STAGE	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Cons	-1.923***	(0.715)	-2.258***	(0.694)	-0.874*	(0.440)	-1.745***	(0.632)
Anc_bks	0.215***	(0.052)	0.173***	(0.050)	0.032	(0.032)	0.121**	(0.046)
Anc_ven	0.143	(0.099)	0.165	(0.096)	0.011	(0.061)	0.113	(0.087)
Anc_acc	0.135	(0.099)	0.126	(0.096)	0.079	(0.061)	0.111	(0.087)
Anc_cln	-0.101	(0.138)	-0.107	(0.134)	0.106	(0.085)	0.018	(0.122)
Anc_wrd	-0.099	(0.067)	-0.090	(0.065)	-0.028	(0.041)	-0.102	(0.060)
Anc_vis	0.007	(0.092)	0.079	(0.089)	-0.002	(0.057)	0.021	(0.081)
Anc_lgt	0.017	(0.092)	-0.006	(0.089)	-0.105*	(0.057)	-0.052	(0.081)
Anc_lav	-0.023	(0.064)	-0.047	(0.063)	0.015	(0.040)	0.002	(0.057)
Anc_lft	-0.007	(0.055)	0.031	(0.053)	0.024	(0.034)	0.020	(0.049)
R-squared	0.371		0.356		0.185		0.283	
Adj R-squared	0.268		0.251		0.052		0.166	
F(9,55)	3.6 [0.001]		3.38 [0.002]		1.39 [0.216]		2.41 [0.022]	
Breusch-Pagan het. chi2(1)	0.03 [0.873]		0.000 [0.986]		0.03 [0.855]		0.4 [0.527]	
linktest	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
_hat	1.038***	(0.189)	0.990***	(0.184)	1.001***	(0.266	0.974***	(0.208)
_hatsq	0.088	(0.212)	-0.038	(0.244)	0.090	(0.812	-0.179	(0.351)
_cons	-0.038	(0.052)	0.015	(0.141)	-0.006	(0.085	0.041	(0.125)

The publication of grades for the ancillary services, particularly in the case of low grades, might induce a reaction in the museum management, aimed at counteracting this weaknesses and increasing the overall efficiency of the museum. A prompt and successful reaction might change the subsequent attractiveness of the museum and, finally the number of admissions. Hence the use of *Adm_ave*, with some of the data referred to periods after the publication of grades, is in principle subject to an endogeneity issue. In practice, a neat and quick reaction to the publication of grades is unlikely, also because of the quite farraginous management process of Italian public museums. Moreover, the empirical impact of this causal chain is weak at best, as already shown. Anyway, in Table 4, column 2 we use as dependent variable *Adm_pre*, our third different measure of attractiveness, the yearly average admissions of a museum computed over the available period up to the year of the expert visit, immune to any endogeneity problem. Again, the empirical evidence supports the robustness of our previous conclusions.

TABLE 4 ï Robustness checks (I)

	(1)		(2)		(3)	
Dependent var	Adm_ave		Adm_pre		Adm_yea	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Cons	10.004***	(2.927)	10.035***	(2.931)	9.771***	(3.315)
Mus	0.516***	(0.173)	0.472***	(0.173)	0.378*	(0.189)
City	0.115	(0.233)	0.118	(0.233)		
Pop	-0.164	(0.198)	-0.163	(0.198)	-0.116	(0.230)
Anc_bks	0.182***	(0.053)	0.194***	(0.053)	0.233***	(0.056)
Anc_ven	0.131	(0.094)	0.157	(0.094)	0.130	(0.108)
Anc_acc	0.101	(0.094)	0.092	(0.094)	0.108	(0.102)
Anc_cln	0.088	(0.140)	0.060	(0.140)	-0.043	(0.156)
Anc_wrd	-0.060	(0.069)	-0.081	(0.066)	-0.074	(0.074)
Anc_vis	0.013	(0.087)	0.021	(0.087)	0.001	(0.096)
Anc_lgt	-0.049	(0.090)	-0.056	(0.090)	0.002	(0.100)
Anc_lav	-0.018	(0.060)	-0.003	(0.060)	-0.005	(0.068)
Anc_lft	0.021	(0.052)	0.019	(0.052)	-0.017	(0.060)
Prov_Fi	1.212**	(0.466)	1.190**	(0.467)		
Prov_Rm	0.566	(0.364)	0.564	(0.365)		
Prov_Ve	1.667***	(0.555)	1.706***	(0.557)		
City_North					0.371	(0.253)
City_Centre					0.483*	(0.268)
City_South					0.290	(0.325)
Number of obs	65		65		65	
R-squared	0.653		0.659		0.555	
Adj R-squared	0.546		0.554		0.431	
	F(15,49)=6.14 [0.000]		F(15,49)=6.3 [0.000]		F(14, 50)=4.46 [0.000]	
Breusch-Pagan het. chi2(1)	0.62 [0.431]		1.13 [0.289]		0.05 [0.824]	
linktest	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
_hat	0.247	(1.866)	0.289	(1.805)	-3.106	(2.561)
_hatsq	0.033	(0.082)	0.031	(0.079)	0.184	(0.115)

_cons	4.260	(10.596)	4.006	(10.206)	22.709	(14.209)

TABLE 5 ï Robustness checks (II)

FIRST STAGE	(1)		(2)		(3)	
Dependent var	Adm_ave		Adm_pre		Adm_yea	
Cons	11.681***	(3.089)	11.813***	(3.171)	10.408***	(3.621)
Mus	0.458***	(0.160)	0.433**	(0.165)	0.345*	(0.184)
City	0.433*	(0.226)	0.431*	(0.232)		
Pop	-0.121	(0.211)	-0.130	(0.217)	-0.041	(0.250)
Prov_Fi	1.430***	(0.478)	1.462***	(0.491)		
Prov_Pi	-2.332**	(1.001)	-2.204**	(1.028)		
Prov_Rm	0.879**	(0.393)	0.889**	(0.403)		
Prov_Ve	1.489**	(0.590)	1.558**	(0.605)		
City_North					0.635**	(0.262)
City_Centre					0.847***	(0.275)
City_South					0.530	(0.335)
Number of obs	65		65		65	
R-squared	0.473		0.456		0.279	
Adj R-squared	0.409		0.389		0.218	
	F(7,57)=7.32 [0.000]		F(7,57)=6.83 [0.000]		F(5,59)=4.57 [0.001]	
test Mus + City=1 north					F(1,59)=0.01 [0.944]	
test Mus + City=1 centre					F(1,59)=0.52 [0.472]	
test Mus + City=1 south	F(1,57)=0.210 [0.652]		F(1,57)=0.3 [0.586]		F(1,59)=0.14 [0.713]	
Breusch-Pagan het. chi2(1)	0.000 [0.999]		0.007 [0.795]		1.04 [0.308]	
Linktest	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
_hat	-0.612	(2.790)	-0.907	(2.953)	-8.898	(5.544)
_hatsq	0.070	(0.122)	0.083	(0.129)	0.446*	(0.250)
_cons	9.163	(15.914)	10.842	(16.843)	54.651*	(30.672)
SECOND STAGE	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Cons	-1.829***	(0.638)	-1.867***	(0.642)	-1.847***	(0.711)
Anc_bks	0.119**	(0.046)	0.130***	(0.047)	0.202***	(0.052)
Anc_ven	0.115	(0.088)	0.137	(0.089)	0.096	(0.098)
Anc_acc	0.115	(0.088)	0.108	(0.089)	0.137	(0.098)
Anc_cln	0.013	(0.124)	-0.004	(0.124)	-0.048	(0.138)
Anc_wrd	-0.095	(0.060)	-0.114	(0.060)	-0.095	(0.067)
Anc_vis	0.016	(0.082)	0.027	(0.083)	0.016	(0.092)
Anc_lgt	-0.055	(0.082)	-0.063	(0.083)	-0.003	(0.092)
Anc_lav	-0.010	(0.056)	0.003	(0.058)	-0.017	(0.064)
Anc_lft	0.044	(0.049)	0.043	(0.050)	-0.008	(0.054)
Number of obs	65		65		65	
R-squared	0.292		0.319		0.349	
Adj R-squared	0.176		0.207		0.242	
F(9,55)	2.52 [0.017]		2.86 [0.008]		3.27 [0.003]	
Breusch-Pagan het chi2(1)	0.56 [0.453]		0.85 [0.358]		0.00 [0.960]	

linktest	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
_hat	0.973***	(0.204)	0.965***	(0.191)	0.959***	(0.199)
_hatsq	-0.172	(0.333)	-0.200	(0.285)	-0.096	(0.228)
_cons	0.042	(0.126)	0.056	(0.126)	0.037	(0.140)

A second robustness extension, instead of considering the provincial dummies, distinguishes between the attractiveness of the city in the North, Centre and South Italy. Only the Centre zone dummy (with Florence and Rome) exerts a positive and significant effect. The estimated coefficient about the artistic relevance of the museum has a reduced size, but still remains significant at the 10% level, whereas only the bookshop is still important among the ancillary services offered by museums.

None of the regressions of Table 4 shows signs of heteroskedasticity or misspecification.

In Table 5 we extend the robustness checks to the two-stage procedure developed in Table 3. The empirical evidence also in this case provides a neat support to our previous findings. The change in the dependent variable, both in terms of *Adm_ave* (column 1) and *Adm_pre* (column 2) are in line with those of Table 3. The estimated coefficients for the artistic grade of the museums and the cities are both positive, significant and roughly similar in size, while the bookshop is the only relevant ancillary service. No sign of misspecification or heteroskedasticity emerges, whereas the two elasticity coefficients add again to one.

5. Conclusions

In this paper we have analyzed the determinants of the attractiveness, measured in terms of admissions in a year, of a sample of the most important Italian museums. In most cases it is difficult to disentangle the impact of the different characteristics of museums on their attractiveness. Such a task can be accomplished through a reconstruction of the individual preferences of the visitors of a given museum, but comparisons are then difficult, because of the specificities of the various analyses.

By using publicly known evaluation scales about the relevance of museums, of the city where are located and of museums' ancillary services, we are able to evaluate the impact of these characteristics on yearly admissions.

As the potential visitor is informed about the artistic relevance of a city and of a museum, this information crucially influences the decision to visit. Moreover, museums are not detached from their territories, as the admission performance is enhanced if they are located in areas with an

inherited strong cultural profile, particularly in the case of superstars like Florence, Rome and Venice.

On the other hand, the ancillary services of museums are of secondary importance in determining the flow of visitors. The only relevant exception are bookshops. Also the international recognition of the cultural relevance of a site or city, given by the inclusion in the Unesco World Heritage List, or the institutional classification between public or private museums, are not empirically relevant variables.

Albeit our analysis is not explicitly tailored in terms of management strategies, the empirical evidence presented in the paper suggests that the emphasis often given to ancillary services is not justified, if the outcome is measured in terms of admissions[12]. The picture which emerges is not that of a quite traditional and conservative visitor of Italian museums, located in historical buildings, without an iconic image like the Bilbao Guggenheim or the New York Moma. In fact, the main insight is that the development of ancillary products cannot substitute a strategy of rejuvenation and valorization of collections ï the core business of Italian museums.

[12] The relevance of these services might be greater in terms of visitorsô expenditure. Our dataset does not allow any conclusion in this respect.

References

Bedate A.M., Herrero L.C. and Sanz J.A., 2009, Economic valuation of a contemporary art museum: correction of hypothetical bias using a certainty question, *Journal of Cultural Economics*, 33(3) 183-99.

Brida, J.G., Meleddu M. and Pulina M., 2011, The attractiveness of a modern and contemporary art museum, CRENoS WP n. 201106.

Castellani M., Pattitoni P. and Vici L., 2014, Pricing visitor preferences for temporary art exhibitions, *Tourism Economics*, forthcoming.

Cellini R., 2011, Is UNESCO recognition effective in fostering tourism? A comment on Yong, Lin and Han, *Tourism Management*, 312, pp. 213-20.

Choi A.S, Ritchie B.W., Papandrea F. and Bennett J., 2010, Economic valuation of cultural heritage sites: A choice modeling approach, *Tourism Management*, 312, pp. 213-220.

Jaffry S. and Apostolakis A, 2011, Evaluation individual preferences for the British Museum, *Journal of Cultural Economics*, 35(1), 49-75.

Patuelli R., Mussoni M. and Candela G., 2013, The Effects of World Heritage Sites on Domestic Tourism: A Spatial Interaction Model for Italy, *Journal of Geographical Systems*, 15, 3.

Pregibon, D. 1979. Data analytic methods for generalized linear models. PhD diss., University of Toronto.

Skinner S.J, 2006, Estimating the real growth effects of a blockbuster art exhibits: A time series approach, *Journal of Cultural Economics*, 30, pp. 109-125.

APPENDIX

	Building	Accessib	Cleanlin	Wardens	Visibility	Lighting	Toilette	Bookshop	Lift	City qual	Museum qual	Region pop	Admiss, year visit	Admiss, aver	Admiss, pre visit
Building	1														
Accessibility	0.346***	1													
Cleanliness	0.647***	0.383***	1												
Wardens	0.294**	0.430***	0.321***	1											
Visibility	0.465***	0.459***	0.569***	0.432***	1										
Lighting	0.574***	0.278**	0.700***	0.269**	0.461***	1									
Lavatories	0.334**	0.307**	0.375***	0.312**	0.298**	0.268**	1								
Bookshops	0.139	0.437***	0.212*	0.202	0.229*	0.110	0.315**	1							
Lifts	0.340***	0.211	0.488***	0.148	0.329***	0.380***	0.392***	0.298**	1						
City quality	0.235*	0.098	0.262**	0.240*	0.115	0.172	0.293**	0.307**	0.113	1					
Museum quality	-0.116	-0.093	-0.359***	-0.143	-0.204	-0.378***	-0.078	0.088	-0.287**	0.337***	1				
Regional pop	0.082	0.208*	0.135	0.312**	0.231*	0.063	0.223*	0.201	0.158	0.362***	0.135	1			
Admiss, year of visit	0.100	0.200	0.015	0.045	0.100	0.013	0.108	0.412***	0.026	0.286**	0.395***	0.004	1		
Admiss, average	0.111	0.181	0.007	0.036	0.096	0.019	0.102	0.388***	0.024	0.272**	0.396***	0.006	0.991***	1	
Admiss, pre visit	0.104	0.190	0	0.027	0.096	0.006	0.110	0.404***	0.028	0.280**	0.403***	-0.001	0.995***	0.994***	1