Journal of Environmental and Resource Economics at Colby

Volume 2
Issue 1 *Spring 2015*

Article 7

2015

An Exploratory Statistical Analysis of the External and Internal Effects of Art Museums in the United States

John Eder
Colby, jmeder@colby.edu

An Exploratory Statistical Analysis of the External and Internal Effects of Art Museums in the United States

Cover Page Footnote

Professor Sahan Dissanayke for his guidance in the research process, key insight into economic analysis, and motivation to explore this topic. Lauren Lessing and the Colby Art Museum Faculty for their support and access to excellent resources that allowed this project to exist.

Introduction:

This paper intends to explore the statistical relationship between museum characteristics and real estate prices, and also the internal drivers of museum characteristics. The goal is to better understand any connections that exist. First, how well do museum characteristics predict real estate prices? This task here is difficult and requires an exploration of many measurable qualities of an art museum. Second, what are the best characteristics for measuring the quality of a museum? Compiling a hedonic set of variables with a good fit is necessary to understand this further. Third, and lastly, do sub-datasets such as region, urban population, or classification, or funding skew the data? There has been little economic research performed on this topic; however, many studies exist that provide insight into how to properly analyze the connections that may exist

Literature Review:

Art Museums exist in our economic system in many forms and in various locations. They are unique goods because they can be categorized and public and non-public goods. Additionally, they serve many functions to preserve and educate our culture. According to Martin Feldstein,"[Museums] play a central role not only in the current cultural life of the nation but also as conveyors of our cultural heritage from one generation to the next…. financially they are relatively neglected stepchildren of our affluent economy (Feldstein, 1)." Museums are a unique asset due to the incredibly high valuation of their collections and proportionally low operating budgets (Feldstein, 1). Understanding such valuation is complicated, especially when local real estate values are added to the analysis. This area of research is relatively unexplored; however, several studies indicate research and methods that can be applied to this topic. Many focus on an in-depth analysis of specific observations, while others utilize a broader view to look an industry statistics and trends.

Three studies analyze art museums from a narrow prospective by looking at several sample museums to look at various effects. First, Naomi Kinghorn and Ken Willis in "Estimating Preferences for Different Art Gallery Layouts Using a Choice Experiment, Museum Management and Curatorship" use a CE survey to understand consumer preferences in two sample art museums. Through stated and revealed preference methods they analyze the value of a hedonic set of museum characteristics (Kinghorn; Willis, 45-49). They find several interesting results because this is the first study of its kind; however, they find the difficulty in concluding that consumer decision-making should drive curator or director decision-making. This is cited as an issue because "estimating the value of cultural

or heritage goods is complex and often problematic" (Kinghorn; Willis, 54-55), and the mission of the museum may not be entirely consumer based.

Next, research at Williams College and The University of Memphis analyzed the economic impacts of two art museums. Stephen Sheppard at Williams College in a piece titled "Brief Summary of the Economic Impact of the Toledo Museum of Art in Toledo, Ohio" cites that museums positively impact the following sectors: real estate, insurance carriers, hospitals, food services, and offices of physicians and dentists (Sheppard, 1). This research uses a "standard input/output" analysis and measures museum and local expenditures at the county level (Sheppard, 1-3). Similarly, Gnuschke and Wallace at The University of Memphis used a method like that of Sheppard in "A Brief Summary of the Economic Impacts of the Eggleston Museum." They used a similar model called "IMPLAN" that assessed the total effect of the Eggleston Museum by measuring the economic output, employment effect, labor income effect, and value added (GDP change) of this museum (Gnuschke; Wallace, 8). Their goal is to deduce the "Value Added" from the direct, indirect, and induced effects that the museum has on the local economy (Gnuschke; Wallace, 8). Overall, both papers indicate that a positive economic effect exists with the presence of their respective art museums.

Two economic studies shed light onto how to evaluate a museum's success and therefore associate the results with real estate prices. "An Introduction to 'The Economics of Art Museums'" (1991) by Martin Feldstein provides insight into the economic importance of art museums. He cites their uses of funds and sources of funds to understand their financial standing. He concluded that a "quantifying trade-off" exists in discretionary museum practices such as admission, spending, and selling (Feldstein, 6-9). Understanding what tradeoffs exist is not an easy task not only due to the way art museums function internally, but also due to the broad array of goals that they have (Feldstein, 7). Second, "Art Museums in the United States: A Financial Portrait" (1991) by Richard N. Rosett builds on the theory of Feldstein and discusses The Association of Art Museum Directors, an important institution of art museum membership (Rosett, 130). It also explores the significant measures of prosperity such as geographic distribution, revenue, expenditures, size, and financial problems. The in-depth financial analysis provided by Rosett is derived from the recently established Director's Survey from the AAMD; it exists as a tool to better understand each museum on a lengthy annual survey (Rosett, 130).

Rosett makes several observations that indicate that an art museum's revenue, endowment, expenditure, and collection size are the key financial figures that point towards "stable growth" (Rosett, 169). In the year of his analysis, 1989, he dropped 43 of the sampled size of 155 museums to reduce the data to 112 opbservations. This is due to the difficulty of comparing non-United States surveys to those completed in Canada or Mexico, and also the existence of incomplete

surveys (Rosett, 131-132). From this list, he concludes that revenue is the "sum that best represents the amount of money available for spending on the museum's principal missions," and that it is a critical quantifiable characteristic for analysis (Rosett, 140). Additionally, the source of revenue is equally as important; however, endowment utilization is debatably more important because it can allow for planning in the long-run (Rosett, 147). To this extent, measurement of a museum's endowment characteristics is important in museum growth and mission (Rosett, 147). Lastly, expenditures represent the choices that museums make; therefore, expenditure on compensation, development and operations, education, conservation, library, and capital expansion and expenditure provide insight into how to analyze "quantifying tradeoffs" (Rosett, 152-155). In closing, Rosett touches on how total insurance value from the AAMD survey is the best valuation for a museum's collection and that issues can arise with collection management such as acquisition and sale of pieces (Rosett 159-160). Since all art museums have their own formula for how revenue, endowment, expenditure, and collection size will benefit them the best, it is difficult to produce one that fits all museums. This research in this paper (2015) aims to provide a loose framework of how using such figures and other measures from the AAMD survey can potentially show trends across sample and subsample sets.

Data Selection and Manipulation:

Three datasets are used in this research. Two sets of data have been combined into one to complete "Set A." This is made to best understand the two subject matters: real estate and museums. Part one of Set A comes from the 2014 AAMD's annual Director's survey. The initial dataset contains 218 observations from 241 questions filed by the director or head curator of every distinguished art museum in the United States, Canada, and Mexico. This value has been trimmed from 241 to 90 variables over 199 observations. Nineteen variables were dropped due to their location being outside of the United States. This data contains a broad array of questions that can be categorized into several groups: classification and general information, spatial features, and finances. The data in this set is in several numerical forms: binary, dummy, monetary value, and counted value, and percentage.

The second part of Set A contains the real estate information. This set contains only six variables: population density (by zip code), median real estate value (by zip code), median income (by zip code), population density (by county), median real estate value (by county), and median income (by county). These values are sourced from City-Data. These variables have been matched to the zip codes and county codes of the 199 observations.

Set B is a single dataset that contains county demographics for every county in the United States in 2014. It is sourced from the United States Census Bureau.

Sample variables from this set are *MedianHousingUnit*, *Population*, *TotalNumberOfFirms, Bachelor'sHigher*, *RetailSalesPerCapita*, and *LandAreaInSquareMiles*. This set is used for examining demographic changes that exist in areas with and without an art museum.

Several transformations and manipulations exist on Set A and B. First, several variables are used in their logged form to accommodate issues with relative scale of variables. This transformation results in the following new variables for Set A: medianhousingprice_log, countymedianhousingprice_log , populationdensity_log countypopulationdensity_log, income_log, countyincome_log, totalattendance_log, webvisits_log, grosssquarefeetstructure_log, totaloperatingbudget, revtotalsurvey_log ,totaloperatingbudget_log, totaloperatingbudget_log, marketvalueendow_log, totalinsurancevalue_log, acq_totalcost_log, and acq_totaldon_log. Additionally, the following dependent variables from set A are transformed to log form too: medianhousingprice_log, countymedianhousingprice_log, populationdensity_log, countypopulationdensity_log, income_log countyincome_log, totalattendance_log, revtotalsurvey_log, marketvalueendow_log, totalattendance_log.
For set B, a few variables were transformed, yet, not used in the final results. Overall, the transformations greatly improved the fit of the regressions.

Methodology and Modeling Approach

The process of analyzing the data requires several linear regressions for set A and set B. For set A, The STATA analysis includes a set of dependent variables: *medianhousingprice_log* (*countymedianhousingprice_log* for county analysis), *totalrevenue_log*, *marketvalueendowment_log*, and *totalattendance_log*. These variables are then each regressed over a set of attributes from the AAMD questionnaire into the following categories of variables: classification and general information, structural features, and fiscal measures. The data is also be evaluated in sub-datasets titled "urban," "northeast," and "college" based on the dummy variables that represent these categories. This process enables the individual categories of observations to be sorted out and analyzed outside of the larger sized sample regressions at the zip code and county data. For set B, the model uses *medianhousingprice* (no log) as the dependent variable.

The analysis involves seven sets of regressions: each serves a purpose on understanding either the external effects or internal effects. The STATA analysis involves a set of preliminaty regressions performed on large quantities of variables for the 199 observations. It is clear that several of the variables need to be transformed or dropped to improve the overall R-squared of the equations.
The first four regressions are focused on the external effects. Three use data from set A and one uses data from set B. The first three from set A use *medianhousingprice_log* as the dependent variable and regress this over the three

sub-datasets of set A: general information, structural features, and fiscal measures (tables 1-3). The third and final external measure regresses *medianhousingprice_log* over the demographic data at the county level. This regression excludes counties in states without a museum on the AAMD survey (199 observations) and also if the median housing value is less than $60,000 (table 4).

The last three regressions address the internal effects by using the following dependent variables: *totalrevenue_log*, *marketvalueendowment_log*, and *totalattendance_log*. Revenue, endowment size, and attendance are all internal measures of museum growth (Rosett, 147). The theory here is that if quantifying tradeoffs exist, variables from the survey will show how certain tradeoffs impact the three dependent variables (Feldstein, 6-9). Furthermore, it provides examples of how an art museum can optimize the attributes such as their collection or finances such as capital expenditure on the type of new square footage.

Results:

The results of the regressions point out several external and internal trends in art museums for the year 2014. Notably, admission's relationship with real estate prices, expenditure on exhibition space, types of grant money, real estate price effect, and key drivers of admissions are categories of results where many variables show interesting relationships or effects. Furthermore, many of the internal effects models show finding in stride with Rosett's findings in 1991.

The external models (table 1-4) provided many interesting conclusions. As shown in table 1, population *density_log* and *income_log* have a positive and statistically significant effect on housing prices at the zip code level. Contemporary, Encyclopedic, and Single Artist art museums all have a negative and statistically significant effect on housing prices at the zip code level. Interestingly, college museums were only found to have statistical significance on housing prices within the subset "northeast" where this effect is negative. Additionally, in this subset, *degreegrantingcomponent* has a statictically positive effect on real estate prices. In the "college" subset, *totalattendance*_log has a statistically significant and positive effect on real estate prices. The most notable finding in table one pertains to admissions. *Admissionpaid* has a positive and statistically significant effect on the dependent variable for the "zip," "county," "urban," and "college" sets. *Admissonspecialpaid* has the same effect and significance, yet of a negative sign in these four cases. This indicates that museums as public goods (no admission fee) may have a negative effect on real estate prices, while non-public good museums have a positive effect on real estate prices. However, this finding only pertains to those museums where entrance to special exhibitions is free since the following conclusion states that a negative effect exists for museums that require a fee for the special exhibition. Interestingly, the "northeast" set does not find any of these admissions effects to be significant.

Table 2 and 3 look at the external effects of the structural features and fiscal measures in art museums. As displayed in table 2, not many structural features have an effect on housing prices at any of the levels. At the zip code level, percent of square feet dedicated to library and storage space (*Sqft/lib* and *Sqft/Storage*) have a statistically significant negative effect. Conversely, percent of square feet dedicated to offsite storage has a statistically significant positive effect (*Sqft/Offsite*). This indicates that square feet dedicated toward exhibition space (*sqft/exhibitionspace* has positive sign) is more valuable than library or storage space; however, storage offsite frees up space for other features and therefore has a positive effect in line with that of exhibition space. For the subset "college," total square feet and percentage of square feet for education also had a statistically significant positive effect on real estate prices. The external effects of fiscal measures in table 3 show several interesting findings. With respect to grants, Federal and National Endowment for the Art's grants have a statistically significant negative effect, while in kind support has a statistically significant positive effect. This is in line with Rosett's finding that grants from the government do not have the same effect as donations from corporations and individuals. In kind giving allows museums to grow their endowment, rather than receiving federal support that is used for revenue (Rosett, 140). Table three also shows statistical significance for several operating expenditures. This is in line with Rosett's conclusion that expenditures are important signs of how the museum makes choices (Rosett, 152). Operating Budget, Percentage of the operating budget on development, and also personnel are all found to have a positive effect. In the "college" subset, cost per acquisition and value per donation also have a positive and statistically significant effect on the dependent variable.

Set B's results are shown in table 4. They find that the presence of an art museum decreases the median housing price of a home by almost $19,000. In this set, income, travel to work, retail sales per capita, and land area are also significant variables for demographic areas where a sample AAMD museum exists. This finding is interesting, yet, must be taken with a few caveats due to the nature of the methodology used. Since this is a preliminary attempt and time is limited, the set contains several outliers. From the 199 samples, it is difficult to show their impact within a set that has thousands of counties in the United States. A more effective method of analysis here is a matching technique where each sample has representative counties that have similar demographics. Overall, this is an interesting finding and more exploration into this set would prove to be an interesting study.

The internal effects models are shown in tables 5, 6, and 7. The first regression (*revtotalsurvey_log* as dependent variable) finds percent of revenue earned, operating budget, endowment spending rate, market value of endowment, insurance value of collection, and number of objects borrowed to be a statistically

significant driver of revenue. All of these are of positive sign except for number of objects borrowed; it's negative sign is intuitive. All of these figures are in line with Rosett's findings from the 1989 survey (Rosett, 129, 178). Interestingly, *totalinsurancevalue_log*, a proxy for the value of a museum's collection, shows to have a statistically significant effect on revenue for all of the sets except for the subset "college." In table 6, the "college" subset, cost per acquisition has a negative sign and is statistically significant. Table 7 shows the results of drivers of the dependent variable *totalattendance_log*. At the zip code level, degree cranting component, days open, admission paid, web visits, and square feet of structure all were statistically significant and of a positive sign, except for admission paid (intuitive explanation). All of these findings are interesting and shed light on some of the key variables in art museum admissions. Interestingly, none of these variables are significant for the subset "college," yet, they are all of the same sign. Also, *admissionpaid* is not found to be significant for art museums in the "northeast" set.

Overall, a lot can be done with these two datasets to more accurately access the relationships that art museums have with external demographics, real estate prices, and their own quest for steady growth by examining internal measures. Museums have financial, educational, reputational, and competitive goals. This research aims to explore the "quantifying tradeoffs" that exist (Feldstein, 7). Without a doubt, many of these connections are causal, but many are correlated. Finding the exact relationships that exist is an incredibly complex task that will hopefully be evaluated in the future as the significance of the finding will not only help museums to grow, but also allow their communities to grow with them.

Table 1.

	(zip)	(county)	(urban)	(northeast)	(college)
	medianhousingprice_log	countymedianhousingprice_log	medianhousingprice_log	medianhousingprice_log	medianhousingprice_log
populationdensity_log	0.119**	0.0619	0.316***	-0.0128	0.0722
	(2.09)	(1.63)	(4.66)	(-0.12)	(0.80)
income_log	0.615***	1.290***	0.616***	0.861***	0.478***
	(5.97)	(3.55)	(5.17)	(5.48)	(3.34)
dummy:	-0.355	-0.263	0.0356	-0.595*	0
	(-1.36)	(-0.91)	(0.17)	(-1.98)	(.)
dummy: Contemporary	-0.587**	-0.329	-0.335**	-0.869***	0
	(-2.39)	(-1.23)	(-2.39)	(-3.36)	(.)
dummy: Encyclopedic	-0.616**	-0.315	-0.282*	-0.856***	0
	(-2.56)	(-1.18)	(-1.87)	(-3.58)	(.)
dummy: single artist	-0.668*	-0.304	-0.587**	-0.697	0
	(-1.90)	(-1.03)	(-2.48)	(-1.59)	(.)
urbancluster	0.166	0.553***	-0.222	0.521*	0.0863
	(0.93)	(4.78)	(-1.29)	(1.74)	(0.20)
urban	-0.119	-0.0228	0	0.468	-0.113
	(-0.80)	(-0.27)	(.)	(1.21)	(-0.38)
northeast	-0.0795	0.0625	-0.219**	0	-0.0854
	(-0.91)	(0.94)	(-2.06)	(.)	(-0.51)
yrsopen	-0.00112	-0.000181	-0.000232	0.000759	0.00237
	(-1.06)	(-0.20)	(-0.23)	(0.50)	(1.34)
degreegrantingcompon	0.0957	-0.151	0.104	0.999***	-0.409
	(0.46)	(-0.68)	(0.47)	(3.31)	(-1.49)
largerorganization	-0.0486	-0.0615	-0.0862	-0.282	0
	(-0.36)	(-0.66)	(-0.55)	(-1.48)	(.)
daysopenperweek	-0.144*	-0.0838*	-0.222***	-0.0631	-0.566**
	(-1.84)	(-1.70)	(-2.90)	(-0.59)	(-2.27)
admissionpaid	0.257***	0.161*	0.290***	0.0519	0.436*
	(3.03)	(1.96)	(3.18)	(0.38)	(1.92)
admissionspecialpaid	-0.237***	-0.156***	-0.240***	-0.0877	-0.642**
	(-2.98)	(-2.61)	(-2.80)	(-0.63)	(-2.64)
totalattendance_log	0.0600	0.00666	0.143*	0.128	0.338***
	(0.88)	(0.16)	(1.73)	(1.44)	(5.08)
webvisits_log	0.0756	0.0428	0.00166	-0.0599	0.0421
	(1.55)	(1.21)	(0.03)	(-0.86)	(0.50)
Constant	4.908***	-1.919	3.075**	3.527**	6.030***
	(4.20)	(-0.49)	(2.19)	(2.26)	(2.92)
Observations	186	187	136	67	47
R^2	0.504	0.605	0.605	0.673	0.600

t statistics in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$

Note: for estimates 2 (county) the variables populationdensity_log and income_log are countypopulationdensity_log and countyincome_log.

Table 2:

	(zip)	(county)	(urban)	(northeast)	(college)
	medianhousingp	countymedianho	medianhousingp	medianhousingp	medianhousingp
populationdensity	0.139***	0.133***	0.264***	0.173***	0.144***
	(4.81)	(4.51)	(6.54)	(5.38)	(2.78)
income_log	0.660***	1.432***	0.594***	0.863***	0.429***
	(6.80)	(4.27)	(5.13)	(6.85)	(3.14)
grosssquarefeetstr	-0.00914	-0.0304	0.00390	-0.0437	0.252**
	(-0.24)	(-0.99)	(0.10)	(-0.79)	(2.04)
sqft/exhibition	0.000131	0.00000783	-0.000138	-0.000699	-0.000591
	(0.17)	(0.01)	(-0.17)	(-0.65)	(-0.36)
sqft/specialexh	-0.000520	-0.000685	-0.000154	-0.000793	0.000607
	(-0.79)	(-1.14)	(-0.21)	(-0.78)	(0.44)
sqft/exhibitionper	-0.000503	-0.000940	-0.0000115	0.000785	-0.00169
	(-0.60)	(-1.38)	(-0.01)	(0.66)	(-1.09)
sqft/outdoor	-0.000103	-0.000450	-0.000516	-0.000571	0.00152
	(-0.11)	(-0.56)	(-0.50)	(-0.43)	(0.82)
sqft/edu	0.000159	-0.000181	0.000108	0.0000524	0.00227*
	(0.21)	(-0.37)	(0.12)	(0.05)	(1.99)
sqft/lib	-0.00177**	-0.000305	-0.00148	-0.00296**	-0.00254
	(-2.06)	(-0.47)	(-1.61)	(-2.37)	(-1.39)
sqft/storage	-0.00145**	-0.000221	-0.000853	-0.00109	-0.000518
	(-2.09)	(-0.35)	(-1.13)	(-1.13)	(-0.44)
sqft/retailsales	0.000602	0.000602	0.000856	0.00146	-0.000394
	(0.84)	(1.09)	(1.14)	(1.23)	(-0.26)
sqft/foodservice	0.000715	-0.000408	0.000477	0.00329**	-0.00276
	(0.72)	(-0.48)	(0.47)	(2.26)	(-1.41)
sqft/office	-0.000138	0.0000474	0.000706	-0.00122	0.00147
	(-0.21)	(0.09)	(1.09)	(-1.37)	(0.92)
sqft/employee	-0.000000680	0.00000840	-0.00000706	0.00000344	-0.000752*
	(-0.05)	(0.63)	(-0.63)	(0.35)	(-1.91)
sqft/offsite	0.00234**	0.00150	0.00243	0.00472**	0.00755**
	(2.05)	(1.58)	(1.46)	(2.08)	(2.22)
percentareoffsite	-0.000257***	-0.000253***	-0.00113	-0.00480***	-0.00646
	(-4.21)	(-4.81)	(-0.61)	(-2.74)	(-1.54)
Constant	4.636***	-3.659	3.840***	2.470	4.065*
	(3.98)	(-1.04)	(3.07)	(1.44)	(1.88)
Observations	197	198	146	74	52
R^2	0.464	0.583	0.549	0.680	0.501

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$
Note: for estimates 2 (county) the variables populationdensity_log and income_log are countypopulationdensity_log and countyincome_log.

Table 3:

	(zip)	(county)	(urban)	(northeast)	(college)
	medianhousing	countymedianho	medianhousingpri	medianhousing	medianhousing
populationdensity_log	0.100**	0.104***	0.180***	0.124*	-0.0417
	(2.60)	(2.76)	(2.72)	(1.84)	(-0.49)
income_log	0.616***	1.308***	0.531***	0.489*	0.292
	(6.77)	(3.72)	(5.39)	(2.00)	(0.88)
totaloperatingbudget	-1.01e-08*	-6.16e-09	-7.85e-09	-1.66e-08	0.000000205
	(-1.70)	(-1.46)	(-1.24)	(-0.81)	(0.63)
grantnationalendowmenta	-0.000000848**	-0.00000131***	-0.00000104***	0.00000138	0.00000892
	(-2.06)	(-2.81)	(-2.68)	(0.43)	(0.97)
grantnationalendowmenth	-0.00000159	-0.000000808	-0.00000149	-0.00000328	-8.38e-08
	(-1.30)	(-0.83)	(-1.16)	(-1.20)	(-0.03)
grantIMLS	3.19e-08	-0.000000408	-0.000000838	0.00000249	0.00000480
	(0.03)	(-0.54)	(-0.94)	(1.30)	(0.47)
grantnationalsciencefound	0.000000458	0.000000522*	0.000000751**	-0.00000713	-0.0000139
	(1.62)	(1.78)	(2.26)	(-0.48)	(-0.46)
grantFED	-9.96e-09**	-4.78e-09	-8.25e-09**	-8.01e-09	0.00000113
	(-2.57)	(-1.55)	(-1.99)	(-0.82)	(0.22)
grantotherGOVt	-0.000000104***	-4.75e-08***	-9.78e-08***	-0.000000286	-0.00000388
	(-5.20)	(-2.64)	(-4.71)	(-0.41)	(-0.33)
grantCITYMUNIC	2.60e-08	7.57e-09	1.05e-08	2.07e-08	0.00000945
	(1.14)	(0.31)	(0.47)	(0.26)	(1.71)
grantUSA	-1.26e-08	-2.41e-09	-1.21e-08	-0.000000587	0.000000697
	(-0.95)	(-0.23)	(-0.78)	(-1.17)	(0.69)
grantSTATE	2.79e-08	1.81e-08	2.14e-08	7.79e-08	0.000000372
	(1.00)	(0.53)	(0.93)	(0.53)	(1.36)
revCOLLEGE	0.122	-0.0191	0.420	-0.871	0.0664
	(0.41)	(-0.08)	(1.39)	(-1.04)	(0.04)
inkindsupport	4.76e-08***	1.41e-08	4.70e-08**	5.70e-08**	-0.000000107
	(2.86)	(0.72)	(2.33)	(2.08)	(-0.93)
collegespending	-0.000000150	-0.000000240**	-0.000000151	5.89e-09	-0.000000533
	(-1.00)	(-2.34)	(-0.91)	(0.02)	(-0.99)
collegesupport	-6.33e-09	-1.47e-08	-5.38e-08	9.39e-08	-0.000000226
	(-0.13)	(-0.45)	(-0.90)	(0.65)	(-0.66)
revtotalsurvey_log	-0.0678	-0.174	-0.112	-0.276*	-0.167
	(-0.91)	(-1.64)	(-1.34)	(-1.77)	(-1.11)
revADMISSIONSpercent	0.000000101	1.38e-08	5.35e-08	0.00160	-0.000000566
	(1.63)	(0.24)	(0.73)	(0.15)	(-0.99)
revCORPSUPPORT	-0.00000730	-0.0000117	-0.00358	0.000624	-0.0000983
	(-0.62)	(-1.26)	(-1.26)	(0.05)	(-0.34)
revPERCENTEARNED	0.00232	0.00432*	0.00354	0.00559	-0.0127
	(0.97)	(1.67)	(1.21)	(1.52)	(-1.80)
opexptotal	7.98e-09	6.51e-09	7.56e-09	1.66e-08	-0.000000149
	(1.46)	(1.64)	(1.25)	(1.04)	(-0.49)
totaloperatingbudget_log	0.280**	0.264*	0.353***	0.429	-0.0297
	(2.56)	(1.97)	(2.71)	(1.47)	(-0.06)
opexp/development	0.00166**	0.00118*	0.00180*	0.000423	-0.00255
	(1.99)	(1.81)	(1.76)	(0.28)	(-0.69)

opexp/tempexhib	-0.000705	-0.000427	-0.000930	0.00145	-0.00134
	(-0.91)	(-0.66)	(-0.99)	(0.83)	(-0.53)
opexp/education	-0.00107	-0.000394	-0.000456	-0.000874	0.00451
	(-1.49)	(-0.76)	(-0.54)	(-0.64)	(1.89)
opexp/pr	0.000186	-0.0000999	0.00115	-0.00205	-0.00140
	(0.23)	(-0.16)	(1.14)	(-1.09)	(-0.44)
opexp/mkting	-0.000239	-0.000601	0.0000918	-0.00248	-0.00915*
	(-0.31)	(-1.05)	(0.10)	(-1.26)	(-2.38)
opexp/catering	0.000600	-0.00103	0.00153	0.00432	-0.00166
	(0.38)	(-0.83)	(0.74)	(1.37)	(-0.26)
opexp/edu	0.00306	0.00442	0.00444	0.00938	0.0180
	(0.35)	(0.67)	(0.46)	(0.45)	(0.40)
opexp/personel	0.00627*	0.00535	0.00575	0.0122	-0.00356
	(1.79)	(1.54)	(1.47)	(1.51)	(-0.28)
opexp/collectioncare	-0.00106	-0.00203	-0.00128	-0.0104	-0.0144
	(-0.16)	(-0.45)	(-0.17)	(-0.74)	(-0.73)
opexp/exhibitions	-0.00539*	0.000821	-0.00334	-0.00545	0.00586
	(-1.67)	(0.30)	(-0.86)	(-0.61)	(0.44)
endowmentgain_log	-0.0120	-0.0110	-0.0217*	-0.00999	-0.0454
	(-1.10)	(-1.00)	(-1.91)	(-0.44)	(-1.11)
	-0.0426	-0.00855	-0.0408	-0.0387	0.209
	(-1.49)	(-0.47)	(-1.33)	(-0.63)	(0.99)
ENDOWMENTspendingres	0.242	0.281	0.363	0.397	0.0711
	(1.11)	(1.46)	(1.52)	(0.90)	(0.06)
endowmentsizenew	-0.0135	-0.0171*	-0.00800	-0.0244	-0.0488
	(-1.25)	(-1.74)	(-0.66)	(-1.32)	(-0.87)
endowmentINDEPENDEN	1.05e-10**	1.11e-10**	-6.95e-10	1.79e-10	-2.52e-10
	(2.31)	(2.46)	(-0.99)	(0.20)	(-0.10)
marketvalueendow_log	-0.0159**	-0.00343	-0.0143	0.00210	-0.0160
	(-2.08)	(-0.60)	(-1.65)	(0.13)	(-0.99)
totalinsurancevalue_log	0.0131	0.0201	0.0255	0.0694	-0.0613
	(0.33)	(0.60)	(0.62)	(0.84)	(-0.29)
acq_totalcost_log	-0.0257	-0.0124	-0.0158	0.00974	-0.108
	(-1.02)	(-0.55)	(-0.53)	(0.16)	(-1.50)
acq_totaldon_log	-0.0253	-0.00967	-0.0161	-0.0499	0.122
	(-0.93)	(-0.49)	(-0.54)	(-0.94)	(1.48)
acq_costper	-0.00140	-0.000699	-0.00454*	0.00372	0.0240*
	(-0.76)	(-0.46)	(-1.95)	(1.15)	(2.50)
acq_donatevalper	0.000695	-0.00143	0.00352**	-0.000529	0.131*
	(0.48)	(-1.40)	(2.00)	(-0.24)	(2.56)
loan_num	-0.000103	0.0000494	-0.000160	0.0000777	0.00877
	(-0.60)	(0.43)	(-1.07)	(0.23)	(1.68)
borrow_num	0.000223**	0.0000535	0.000141*	0.000114	-0.000488
	(2.57)	(0.79)	(1.75)	(0.36)	(-1.08)
Constant	2.292*	-4.159	1.595	3.428	13.70
	(1.88)	(-1.25)	(1.22)	(0.81)	(1.34)
Observations	195	196	144	73	49
R^2	0.583	0.676	0.696	0.838	0.983

t statistics in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$

Note: for estimates 2 (county) the variables populationdensity_log and income_log are countypopulationdensity_log and

countyincome_log.
Table 4.

	(1) Medianhousingprice
museumpresent	-18752.7***
	(6945.0)
Pop 2014	-0.0787
	(0.0525)
Pop Change 10-13	202.3
	(734.2)
HSorHigher	-734.4
	(576.1)
Bachelor'sHigher	2888.9***
	(371.6)
Multi-unithousing	1615.0**
	(627.4)
Percapitainc13	5.099***
	(1.148)
Traveltowork	4081.3***
	(418.4)
Homeownership	-321.3
	(706.8)
Private nonfarm establishments	-1.716
	(1.843)
Total number of firms	1.264
	(0.791)
Retail sales per capita	0.508**
	(0.202)
Land area in square miles	10.79***
	(1.719)
Constant	-88516.2
	(63994.3)
Observations	2812
R^2	0.712
Log lik.	-33663.4
Chi-squared	

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5:

	(zip)	(urban)	(northeast)	(college)
	revtotalsurvey_log	revtotalsurvey_log	revtotalsurvey_log	revtotalsurvey_log
revadmissionpercent	-2.38e-08	-6.04e-08	0.00617	8.68e-10
	(-0.36)	(-0.84)	(0.66)	(0.01)
revcorpsupport	-0.00000461	0.00226	0.00536	-0.0000107
	(0.41)	(0.76)	(0.47)	(-0.62)
revpercentearned	0.0127***	0.0127***	0.0120***	0.0115*
	(4.88)	(3.82)	(3.45)	(1.98)
totaloperatbudget_log	1.087***	1.059***	1.241***	0.548**
	(18.26)	(15.13)	(9.58)	(2.40)
opexp/personel	0.00137	-0.00409	-0.00925	-0.00813
	(0.31)	(-0.87)	(-1.19)	(-0.68)
endowmentGAIN	-6.37e-09	-9.38e-09	-1.24e-08	-0.000000289***
	(-1.08)	(-1.33)	(-0.79)	(-3.18)
endowmentgain_log	0.0109	0.0141	0.00580	0.0640
	(0.76)	(0.83)	(0.32)	(1.54)
endowmentspendrate	0.0965***	0.112***	0.101*	0.0254
	(3.98)	(3.57)	(1.72)	(0.41)
endowspendraterest	-0.0746	0.0772	0.959	0.936
	(-0.26)	(0.21)	(1.50)	(1.15)
endowmentSIZE	-4.58e-11	-1.08e-10	-1.24e-10	2.10e-09
	(-0.67)	(-1.27)	(-1.29)	(0.18)
endowmentindsepend	1.11e-09	1.91e-10	6.59e-10	1.61e-08***
	(1.51)	(0.26)	(0.63)	(3.74)
marketvalueendowment	8.86e-10*	1.17e-09**	1.43e-09	2.22e-08
	(1.82)	(2.02)	(1.06)	(1.48)
marketvalueendow_log	0.00207	-0.00592	0.00258	-0.0170
	(0.25)	(-0.58)	(0.16)	(-0.66)
totalinsurancevalue	-0.00816**	-0.00836**	-0.0129***	-0.0153
	(-2.13)	(-2.12)	(-2.71)	(-1.26)
totalinsurancevalue_log	0.193**	0.217**	0.273***	0.216
	(2.25)	(2.36)	(2.80)	(1.42)
acq_totalcost_log	0.0506	0.0614	0.104**	0.0888
	(1.56)	(1.46)	(2.22)	(0.99)
acq_totaldon_log	-0.00437	-0.00510	0.00971	-0.00567
	(-0.17)	(-0.15)	(0.26)	(-0.07)
acq_costper	-0.00101	-0.00210	-0.000914	-0.0129**
	(-0.91)	(-1.16)	(-0.23)	(-2.38)
acq_donatevalper	0.00287	0.00386	0.00513***	0.00934
	(1.54)	(1.66)	(2.96)	(0.49)
numobjectsloaned	-0.0000410	-0.0000324	-0.000195	0.000761
	(-0.27)	(-0.19)	(-0.87)	(0.28)
numobjectsborrowed	-0.000196***	-0.000197**	-0.000223**	-0.000399**
	(-2.99)	(-2.59)	(-2.06)	(-2.47)
Constant	-4.035***	-3.665***	-7.457***	3.374
	(-4.22)	(-3.43)	(-3.48)	(0.99)
Observations	196	145	73	50
R^2	0.866	0.873	0.906	0.830

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 6:

	(zip)	(urban)	(northeast)	(college)
	marketvalueendow_log	marketvalueendow_log	marketvalueendow_log	marketvalueendow_log
grantotherGOVt	4.77e-08	0.000000106	-0.00000583	-0.0000509
	(0.52)	(1.07)	(-1.36)	(-1.02)
grantCITYMUNIC	0.000000407**	0.000000398**	0.000000292	0.0000106
	(2.31)	(2.27)	(1.09)	(0.42)
revPERCENTEARNED	0.0789***	0.0771***	0.0535*	0.112***
	(4.47)	(4.02)	(1.83)	(3.38)
totaloperatingbudget_log	1.627***	1.478**	0.706	1.280
	(3.41)	(2.46)	(0.95)	(0.56)
endowmentGAIN	7.17e-08**	5.21e-08	1.32e-08	0.000000656
	(1.99)	(1.55)	(0.17)	(0.98)
endowmentSPENDINGRATE	0.319*	0.543**	0.0666	-0.0167
	(1.67)	(2.13)	(0.22)	(-0.04)
endowmentSIZE	2.09e-09**	2.12e-09***	6.02e-09*	-1.53e-08
	(2.05)	(2.81)	(1.77)	(-0.31)
endowmentINDEPENDENTPORTFOLIO	-1.27e-08***	-2.91e-08***	-2.03e-08***	-5.52e-08
	(-3.01)	(-3.45)	(-2.67)	(-1.56)
totalinsurancevalue_log	1.035**	0.941*	1.788**	1.162
	(2.45)	(1.94)	(2.50)	(1.31)
acq_totalcost_log	-0.297	-0.188	-0.486*	-1.394**
	(-1.17)	(-0.60)	(-1.95)	(-2.22)
acq_totaldon_log	-0.326	-0.424	-0.590**	0.184
	(-1.40)	(-1.56)	(-2.29)	(0.26)
69. What is the total number of objects your institution loaned in the last fisc	-0.00562***	-0.00495***	-0.00354	0.0310
	(-5.36)	(-4.38)	(-1.60)	(1.53)
70. What is total number of objects your institution borrowed in the last fiscal	0.00122***	0.00119**	0.00162**	0.0000943
	(2.67)	(2.53)	(2.09)	(0.07)
Constant	-18.41**	-16.52*	-1.607	-13.50
	(-2.59)	(-1.90)	(-0.15)	(-0.40)
Observations	197	146	74	51
R^2	0.347	0.387	0.397	0.378

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 7:

	(zip)	(urban)	(northeast)	(college)
	totalattendance_log	totalattendance_log	totalattendance_log	totalattendance_log
populationdensity_log	0.0458	-0.0133	0.0570	-0.00123
	(1.13)	(-0.17)	(0.99)	(-0.02)
income_log	0.107	0.138	0.0274	-0.0728
	(1.29)	(1.50)	(0.16)	(-0.47)
yrsopen	0.00127	0.00125	0.000561	-0.000513
	(0.90)	(0.73)	(0.27)	(-0.15)
degreegrantingcomponent	0.690*	0.348***	0.220	1.249
	(1.76)	(3.04)	(1.27)	(1.61)
daysopenperweek	0.299***	0.234**	0.393***	0.603
	(3.18)	(2.10)	(2.70)	(1.06)
admissionpaid	-0.248***	-0.273***	-0.162	0.0741
	(-2.85)	(-2.68)	(-1.03)	(0.31)
admissionspecialpaid	0.0873	-0.0147	0.126	0.0850
	(0.78)	(-0.12)	(0.57)	(0.22)
webvisits_log	0.366***	0.462***	0.407***	0.277
	(4.34)	(6.12)	(3.87)	(0.93)
grosssquarefeetstructure_log	0.432***	0.419***	0.313***	0.416
	(4.54)	(4.71)	(3.25)	(1.44)
sqft/exhibition space	0.00128	0.00230**	0.000934	0.00157
	(1.39)	(2.06)	(0.48)	(0.94)
Constant	-1.226	-1.747	-0.185	0.183
	(-0.90)	(-1.17)	(-0.07)	(0.03)
Observations	187	137	67	48
R^2	0.712	0.772	0.738	0.466

t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Works Cited

Avameg, Inc. Dataset. "City-Data" Accessed Monday, March 6th, 2015: http://www.city-data.com

Feldstein, Martin. "An Introduction to 'The Economics of Art Museums.'" The National Bureau of Economic Research: The Economics of Art Museums. University of Chicago Press. January, 1991.

Gnuschke, John; Wallace, Jeffrey. "A Brief Summary of the Economic Impacts of the Eggleston Museum." *Sparks Bureau of Business & Economic Research*. The University of Memphis. May 2012. Accessed 1 May, 2015. http://memphis.edu/sbber/pdfs/i mpactstudies/impact_study_eggleston_museum.pdf

Naomi Longhorn & Ken Willis (2007) Estimating Preferences for Different Art Gallery Layouts Using a Choice Experiment, Museum Management and Curatorship; 22:1, 43-58. March 2007.

Rosett, Richard N.. "Art Museums in the United States: A Financial Portrait." The National Bureau of Economic Research: The Economics of Art Museums. University of Chicago Press. January, 1991.

Sheppard, Stephen. "Brief Summary of the Economic Impact of the Toledo Museum of Art in Toledo, Ohio" *Center for Creative Community Development*. Williams College, Williamstown, MA. Accessed 1 May, 2015. http://web.williams.edu/Economics /ArtsEcon/ library/pdfs/ToledoSummary.pdf

The Association of Art Museum Directors. Dataset. Accessed Monday, March 6th, 2015: https://www.aamd.org.

United States Census Bureau. Dataset. "State and County QuickFacts" United States Census Bureau. Accessed Monday, April, 29th, 2015. http://quickfacts.census.gov/qfd/download_data.html