Measuring the extent to which Londoners are willing to pay for public art in their city.

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Abstract

Contemporary research into future cities tends to focus on technology, architecture and infrastructure. However, this study highlights the importance of public art projects for our future cities. Very little empirical evidence and academic studies exist to determine whether or not public art is core to the life and demand of citizens. Using a hybrid **contingent valuation** (CV) and **wellbeing valuation** (WV) survey approach (Bakhshi et al, 2015), we collected data at two public art initiatives organised by MTArt Agency. 60% of our sample audience were willing to pay at least £5 for the implementation of more public art in their local area, with 84% willing to pay at least £2, and 84% of our sample said regular public art initiatives would increase their wellbeing. A binary logistic regression model was then used to measure the extent to which Londoners are willing to pay for public art and which factors influenced their decision. This paper evaluates the potential financial support and desire from citizens towards public art in their cities. We find evidence to suggest that Londoners are willing to pay for more public art in their local area and discover a range of explanatory variables which influenced their decisions. We hope to add to the existing academic research by demonstrating a core need from the audience towards public art, particularly, a willingness to pay for public art projects to become an integral part of their city experience. It is important to understand the economic value of public art initiatives within smart cities context because it will allow policy makers, urban planners and developers to implement such initiatives in the future. With this innovative multi-disciplinary approach, we hope to enable arts projects to engage wider demographics, obtain stronger financial support and become a more meaningful integration into our urban realm.

Keywords

smart city, public art, contingent valuation, willingness to pay, logistic regression, visual narrative

Section 1: Introduction

Contemporary research into future cities tends to focus on technology, architecture and infrastructure. However, we have observed a rise of public art projects in major cities like London, New York and Los Angeles (Miles, 1997; Motoyama and Hanyu, 2014). Our cities are increasingly affected by rapidly growing populations, for example by 2030, London's population is expected to increase by 15-20%. (Mayor's Design Advisory Group - Growing London). Such growth has led to wider social inequalities and stronger political divisions in certain parts of the world's largest cities (Perrons, 2004; Musterd and Ostendorf, 2013). City mayors, councils, real estate developers and business regeneration districts (BIDs) see the commissions of visual art projects as a cost-effective response to these issues (Sharp et al, 2005; Evans, 2009; Ferrell, 2017). It is to understand the value of these art projects into future cities and how it will benefit future citizens that we are leading this study.

Public art, "works commissioned for sites of open public access", which range from "the exhibition of sculpture outdoors, to community murals, land art, site-specific art, the design of paving and street furniture and performance as art" (Miles, 1997) is by definition art for the public. Former New York Mayor Michael Bloomberg wielded public art as a powerful tool, one integral to building the 'confidence' of citizens, and invested a total of $2.8 billion to cultural organisations (GIA, 2013). A memorable example was the public art project of artists Christo and Jeanne-Claude's, *The Gates,* in Central Park that drew 4 million visitors who, in turn, brought $254 million to the tourism industry (NewPolitics, 2005). In the United Kingdom, the Arts Council in the UK has long advocated for public art arguing that "art on public view gives an impression of social, cultural and economic confidence to the public…" (Miles, 1997:67; Arts Council, 1991:18).

While the thinking that art can cure social divisions (Sharp et al, 2005) and increase wellbeing (Parr, 2006) is common in the creative industries, very little empirical evidence and academic studies exist to determine whether or not the implementation of public art projects is core to the life and demand of citizens. This is an important step to take if we want to integrate them as essential and meaningful features of smart cities. Miles (1997) argues that "there is no systematic evidence that public art has beneficial effects for urban communities". The industry has long relied on individual convictions and philanthropy to supply art initiatives rather than understanding what the wider demographic needs visually (Evans, 2002; Evans, 2005), making it almost impossible to obtain consumers' value for the art projects themselves. By understanding what aspects of public art projects citizens and consumers value, policy makers will implement more valuable and relevant public art initiatives for the future cities.

To interpret the value these projects might bring to citizens, we need to have a stronger understanding of citizens' needs for art projects in their cities. Recently, innovations in academic research have allowed cultural policy to be guided by economic analysis (Bakhshi et al, 2015). In particular, developments in techniques known as *contingent valuation*, adopted from the environmental and transport literature, have become increasingly popular for assessing an audiences' value for cultural goods (Jura Consultants, 2005; Maddison and Foster, 2003; Pung et al., 2004; Bakhshi et al, 2015). A seminal report commissioned by the Arts and Humanities Research Council in the UK aimed to 'measure the public economic

value of cultural institutions' by using a hybrid **contingent valuation** (CV) and **wellbeing valuation** (WV) method (Bakhshi et al, 2015). While the focus of these studies were on institutions, like museums, we decided to implement a similar method to value public art. We believed it to be even more impactful since the audience of public art projects are more varied than ones of cultural institutions. Our aim was to see if they would be willing to contribute financially to public art initiatives, that is, the direct monetary value they saw in these projects.

Our paper concentrates on two projects: the sewer drain project of artist Marine Hardeman in Tower Hamlets Council, London in July 2017 and the London Bridge bollard project of artist Jennifer Abessira from September to November 2017. The first project took place in a lower income and socially diverse neighbourhood of London, with little exposure to art. The artist Marine Hardeman wanted to highlight what we barely notice: sewer drains. She designed a lighting installation that enhanced night walking by creating a perception of value and safety in the installation. Using art as a tool, the artist wished to give value to a non-valued urban element, sewer drains, and turned positively the value of this specific street for its residents, but also to Londoners and tourists who came to watch the installation.

The second project consisted of 72 photographs displayed and wrapped around bollards outside of London Bridge Station for three months. The photographs engaged with the history of the cultural integration of the area by using images from the city's archives. The installation took place two months after the London Bridge attacks of June 2017, additionally, London Bridge train station had also undergone refurbishment over the past couple of years making it less of an enjoyable destination and experience for commuters. The BID Team London Bridge commissioned this project to add value to the people working, living and visiting the area. Every day, 150,000 commuters use the station making it a focal point for Londoners to encounter one another, consume and engage with their city surroundings.

The two projects were conducted by MTArt agency. MTArt supports and invests in the top up and coming artists and does not believe that art should be reserved for only a select few. The agency aims to showcase the artists' visions to the widest possible audience with a series of public art projects, commercial partnerships and digital content. The agency partnered with Vishal Kumar from the Centre for Advanced Spatial Analysis at UCL to undertake primary research, perform a regression analysis of the data and direct the paper according to its findings. The insights are based on survey data collected via a contingent valuation survey. As we aimed to demonstrate the integral nature of public art projects for future cities, we wanted to understand the need and value that its audience -- people working, living and travelling in and to London -- perceived in these projects.

Our research aims to address the evidence gap in relation to public art by answering the following research questions:

- To what extent are Londoners willing to pay for public art initiatives in their city?
- What factors, if any, influence the extent Londoners value the experience of visual art integrated in their city?
- Can researchers measure the economic value of public art initiatives in London?

The objective of this paper is to answer and test the above questions by taking a quantitative economic approach. The data was collected using a dichotomous-choice contingent valuation survey (DC CV survey). The extent to which Londoners want public art initiatives in their city is answered by using a binary logistic regression model to reveal the probability of respondents' willingness to pay (WTP) for such initiatives based on a number of explanatory variables.

The paper aims to add to the existing academic research by demonstrating a core need from the audience towards public art, particularly a willingness to pay for public art projects to become an integral part of our city experience. The paper is organised as follows. Section 2 extends the theory to justify the methods used. Section 3 presents the WTP logistic model. Section 4 explains the variables that determine willingness to pay and presents the results of the regression model. The analysis is extended by parametrically estimating mean WTP (£) of the two MTArt public art initiatives. Section 5 discusses the significance of the results of our work, suggestions for future research and concludes.

Section 2: The methods

2.1. Economic valuation in the context of public art

The increase of public art projects in urban areas calls for the need to evaluate their value using different methods than those more common in cultural studies (Bakhshi et al, 2015: Throsby, 2001), such as, the sales of works of arts or institutional engagement. While public and private organisations are aware of the value of the art itself when commissioning these projects, they often lack knowledge to the extent communities and networks value these initiatives and how much they would be willing to support future public art projects. Determining the economic value of public art is complex but necessary to foresee the wider integration of visual art projects in cities supported by most citizens.

Because a public art project is a public good – a good that is freely available to everyone and is non-rivalrous and non-excludable (Samuelson, 1955) – and, while it bears an art form, its valuation can resemble more strongly to the assessment of public goods in the environmental studies. For example, Regents Park in London is a recreational park and it is a public good available to the citizens of London. Similarly, the Regent's Park **Frieze Sculpture Exhibition**, which is a public art project, takes place every October in London and is also a public good. Both the park and the sculpture exhibition provide utility to Londoners but determining an economic value from the utility is difficult. This is mainly because these good are not traded on the open market, therefore, data points about their 'price' cannot be determined.

2.2. Consumer surplus, use value and non-use value

The distinction between market and non-market goods is important in this context. Although public art has a valuation in terms of its installation costs, the value of the artwork itself and the potential rise of the artwork's value in the art market, capturing the value the consumer (or audience) places on a public art project is much harder because the artwork itself is not easily tradable in an open market context.

We can use the London Bridge area of London as an example to illustrate the distinction between market and non-market goods. If a group of Londoners walk around the London Bridge area on a Sunday afternoon, they may stumble upon Borough Market, one of the oldest food markets in London. If they happen to enter around lunchtime, it's quite probable that they would be looking for something to eat. Different consumers will choose a different choice of food options for their lunchtime meal depending on their personal preference: some may prefer French cuisine; some may prefer traditional English cuisine. Consumers exercise and reveal their personal lunchtime meal preference using the cash they have in their pocket. The price, and hence value, of French food vis a vis English food is thus influenced by the demand of all the consumers within Borough Market who purchase food.

On the other hand, cultural goods, especially those that are publicly owned and freely accessible to the consumer, are different to those exchanged in regular markets (Bakhshi et al, 2015). To continue our story, had the same group of Londoners walked up St Thomas Street during November 2017 after leaving London Bridge Station, they would have certainly

walked past Jennifer Abessira's *Don't Think Twice* bollard project. Unlike consuming food, which is perishable and can be purchased immediately with cash, the Londoners would have certainly consumed the aesthetic, intellectual, cultural and social significance of Jennifer's public artwork. They may have taken photos and uploaded them on social media deriving utility from these exchanges. As described by Bakhshi et al (2015), this means that:

> *Non-market valuation methods must be used to determine the value that people place on visiting these sites, using their services, and conserving them. The importance of cultural assets in terms of their aesthetic, archaeological, educational, intellectual, collective identity, artistic and financial contribution has hence motivated an increasing application of valuation methods with the aim of deriving estimates of monetary values of cultural institutions from a societal point of view, which in turn could be used in project appraisal and decision making.*

'Non-market' is not to say that the good is not valuable. In the environmental economics literature, goods that are not traded in the open market, but provide value to citizens, requires researchers to identify a link between market goods and environmental goods (non-market good) and then utilize this link when evaluating the welfare of the non-market good (Hervani et al, 2017). The total economic value (TEV) of such goods must therefore be assessed against their use-value and non-use value (Bakhshi, 2015; Hervani et al, 2017). By implementing more studies like ours, we are trying to establish the non-use value of public art can find its place in the market of everyday consumers and imagine that these same consumers could, in the future of the smart city, decide on the art that surround them in their city both by financing it and expressing a demand for it.

2.3. Why contingent valuation - measurement method

Having read the academic literature on valuation techniques for non-market goods, Hervani et al (2017) suggested that "the most popular way to obtain the value of public goods have been elicited by the use of survey methods enabling the researcher to obtain consumer's maximum willingness to pay for a public good". In particular, *stated preference* surveys are one of the most popular methods for obtaining the value of non-market public goods (Hervani et al, 2017).

The objective of this study is to estimate the extent to which Londoners are willing to pay for public art initiatives in their city in the future. We adopt the CV method to carry out this objective because it a widely used and standardized survey method for non-market goods (Yoo and Moon, 2006). Whilst there are a variety of other stated preference survey methods to choose from, the CV method is most suitable as it is beneficial for willingness to pay scenarios. The CV method involves constructing a hypothetical market scenario and respondents are asked for their willingness to pay for the hypothetical initiative, in our case, the implementation of more public art in their local area.

2.4. Survey design

After choosing the CV method as the most appropriate for capturing the value of public art from our audience, the next stage was to design the survey in such a way that is was

possible to capture a variety of variables that would help us understand the main factors that influenced Londoner's willingness to pay for future public art initiatives. We adopted a double-bound dichotomous choice structure asking respondents 'Yes' or 'No' if they were willing to pay at three different bid amounts across two levels: £5 for the first level, if they accepted, then £20 for the second level, and if they rejected the first level, then £2 for the second level. We chose the bid levels in line with what it might cost a citizen to go see a paid-for art exhibition at a public institution in London – for instance, to see Modigliani at the Tate Modern in 2017 would cost a normal adult £17.70, moreover, a show at the Whitechapel will cost an adult £12.80. We found the £5 level a good hurdle for the first dichotomous choice question, and then scaled up or down for the second dichotomous question. The DC model is considered the most promising approach to the measurement of welfare using willingness to pay (Buckland et al, 1999) since its was popularised by Hahnemann in 1984. The full survey can be found in the appendix.

Variables

The survey is broken down into five main sections to elicit respondents stated preferences: *art and engagement related questions; a subjective well-being question; the double-bounded dichotomous willingness to pay questions; demographic questions; and, a smart-city related question.* Bakhshi et al's (2015) study design inspired us to explore both a stated preference survey valuation structure as well as a wellbeing valuation approach. Both stated preference and wellbeing valuation are endorsed by HM Treasury's Green Book on cost-benefit analysis (Bakhshi et al, 2015). The question we asked respondents about their wellbeing related to life satisfaction, "*Imagine that a Private Organisation decided to support public art installations in this area once every three months, each installation lasting one week. How would this initiative affect your level of life satisfaction?"*. We understand that that this question alone cannot determine the full extent of a respondents' wellbeing, but framed hypothetically, it provides useful and additional layer to our data.

Sampling survey methods

The survey was implemented by MTArt Agency across both public art installations. The survey was conducted in person via face-to-face interaction. We collected 469 contingent valuation surveys at two public art initiatives. The first public art initiative was a sewer drain project by the artist Marine Hardeman with Tower Hamlets Council in July 2018 for ten days (30th June to the 9th July). The second public art initiative was the street bollard project by artist Jennifer Abessira outside London Bridge Station on St Thomas Street from the 15th September to the 28th November 2018. Employees of MTArt used iPads to collect the data.

Limits survey sampling

Our survey sampling did pose some limitations. Firstly, a pilot survey was not sent out to a random group of respondents beforehand which meant that we did not get the opportunity to test our survey, refine our questions, or evaluate our bid levels. One of the drawbacks are that CV are highly sensitive to survey design and the way the survey is constructed (Hervani et al, 2017). Future research in this area should send certainly send out a pilot.

There were also problems with collecting the data at both locations. The sewer drain public art installation was something that a potential respondent would stop and watch, thus, it was easier to survey respondents in Whitechapel. On the other hand, in London Bridge,

commuters were generally in a rush and the length of the survey meant that collecting data was more challenging.

Moreover, WTP levels may not be a true indication of people's actual preference. Whilst our best is done to frame the survey in such a wat to capture WTP, when people are in a rush and/or are asked hypothetically how much they are WTP, it is not the same as physically spending that amount of money.

2.5. Hypothesis

Both projects offered us a strong opportunity to gather the views of the wider population. Every day, over 150,000 commuters use the London Bridge Station, and as you exit the station, the bollards faced the commuters; equally, the sewer drain project in Whitechapel was located in a central square of the neighbourhood. We hoped that people would be receptive yet had fears that many locals would not like the installations. Both areas had very few public art projects and we hoped that people would value these new artistic integrations. As both projects also used existing urban elements, sewer drains and bollards, we wished they would see it as a way to enhance their area rather than other initiatives which can be more imposing. We also looked for two audiences, commuters and local residents, who are not necessarily assumed to be art supporters. We did this with the aim to study that no matter the background of our sample, there might be willingness towards financially supporting public art projects.

The aim of our analysis was to find out to what extent the variables in the CV survey influenced respondent's willingness to pay for public art. Therefore, our dependent variable is *willingness to pay for public art in the local area* with a range of explanatory variables (*covariates* from now on). Our null hypothesis is that the covariates do influence Londoner's willingness to pay for the installation of more public art in their local area.

Section 3: Binary logistic regression model and WTP estimation equations

The natural way to analyse dichotomous-choice data is a logistic regression (Ben-Akiva, 1985; Buckland et al, 1999). A logistic regression models the probability of an event occurring given a set of explanatory variables and can be understood simply as finding the parameters that best fits:

$$y_j = \begin{cases} 1 & \beta_0 + \sum_j \beta_i x_{ij} \\ 0 & else \end{cases}$$

where y is choice between 1, when a respondent is willing to pay for more public art in the local area, and 0, if the respondent is not willing to pay. The logistic regression function is expressed as:

$$E(y_j) = \frac{e^{(\beta_0 + \sum_j \beta_i x_{ij})}}{1 + e^{(\beta_0 + \sum_j \beta_i x_{ij})}} = \frac{1}{1 + e^{-(\beta_0 + \sum_j \beta_i x_{ij})}}$$

where $E(y_j)$ is the probability that a respondent is WTP based on a range of covariates, x_{ij} is the value of the covariate i for respondent j, $i \geq 1$ and β_i are the coefficients of the covariates to be estimated, $i \geq 0$. The estimates of the coefficients and the intercepts are found via maximum-likelihood estimation (MLE) subject to a log-likelihood function (Ben-Akiva, 1985).

The corresponding fitted model outputs the predicted probability of WTP and is expressed as:

$$\hat{y} = \frac{1}{1 + e^{-(\beta_0 + \sum_j \beta_i x_{ij})}}$$

The final equation of the model in linear form (log-odds) looks like:

$$\log \frac{E(y_j)}{1 - E(y_j)} = \beta_0 + \sum_j \beta_i x_{ij}$$

Hahnemann's (1989) parametric method will be used to estimate mean WTP and looks like:

$$Mean\ WTP = \frac{(\beta_0 + \sum \beta_i \overline{x_i})}{\beta 1}$$

where $(\beta_0 + \sum \beta_i \overline{x_i})$ is the product of the coefficient estimate multiplied by the mean of each covariate plus the estimated constant, and $\beta 1$ is the coefficient estimate from the bid amount (Guo et al, 2014).

Section 4: The Results and discussion

4.1. Social-economic characteristics

	London Bridge	*Whitechapel*	*Both*
Male	49%	47%	49%
Age	31 to 45 (median)	31 to 45 (mean)	31 to 45 (mean)
Household income	£30,001 to £40,000 (mean)	£30,001 to £40,000 (mean)	£30,001 to £40,000 (mean)
Dependent children under 16 years	54%	47%	52%
Married with partner	50%	46%	49%
University Education	80%	67%	77%
In employment (full-time, part-time, self-employed)	80%	77%	79%
Living in London	84%	84%	84%
Race (white) %	55%	50%	54%
Tourists (1)	12%	22%	15%
Lived locally (2)	34%	39%	35%
Local Businesses (3)	38%	35%	35%
Total surveys	**340**	**129**	**469**

Table 1: summary statistics of the socio-economic characteristics of the CV survey data

Table 1 summarises the key socio-economic characteristics across the samples. The proportion of women was higher than male for both the Whitechapel and London Bridge projects and also overall. The mean age and income levels for both samples were the same. A higher percentage of respondents in London Bridge were married, had dependent children, were educated at university level, were white, and were employed than in those in Whitechapel. A higher percentage of respondents in Whitechapel were tourists and local residents, but more were local businesses in London Bridge. Overall, across both samples, 84% of respondents lived in London.

4.2. Engagement characteristics

	London Bridge	*Whitechapel*	*Both*
Frequency of art museum/gallery visits this year	3 to 5 times (mean)	0 to 3 times (mean)	3 to 5 times (mean)
Visited a local arts institution this year (Tate Modern or Whitechapel gallery)	61%	49%	58%
Likelihood of visiting a public art installation in the future (1 = not likely, 5 = very likely)	4 - quite likely (mean)	4 - quite likely (mean)	4 - quite likely (mean)
Enjoyment of current installation (1 = did not enjoy, 5 = enjoyed a lot)	4 - enjoyed (mean)	4 - enjoyed (mean)	4 - enjoyed (mean)
Subjective well-being (will a public art installation increase your life satisfaction?)	85% said "Yes"	83% said "Yes"	84% said "Yes"
Total surveys	**340**	**129**	**469**

Table 2: summary statistics of engagement and art related questions of the CV survey data

Table 2 summarises the key engagement characteristics and attitudes towards culture and the arts. Respondents in London Bridge had generally engaged with arts activities during the year more than respondents in Whitechapel. For example, respondents in London Bridge visited a museum or galleries this year a mean 3 to 5 times compared to 0 to 3 times in Whitechapel - this trend was also true across the entire distribution at the lower and upper quartiles. Moreover, a higher percentage of respondents in the London Bridge sample had been to the local major art museum, the Tate Modern, compared to the Whitechapel Gallery for the Whitechapel respondents. On a scale from 0 to 5, respondents from both samples on average were 'quite likely' (rated as 4) to visit a public art installation in the future and also 'enjoyed' (rated as 4) both installations installed in London Bridge and Whitechapel. Lastly, 84% of the entire sample said that a *public art installations in their area once every three months, each installation lasting one week* would increase their life satisfaction.

4.3. Willingness to pay: distribution of responses by bid amount

Offered bid		London Bridge		Whitechapel		Both	
		"Yes" votes	**"No" votes**	**"Yes" votes**	**"No" votes**	**"Yes" votes**	**"No" votes**
1st level	**£5**	217 *(64%)*	123 *(36%)*	66 *(51%)*	63 *(49%)*	283 *(60%)*	186 *(40%)*
2nd level	**£20**	84 *(25%)*	133 *(39%)*	25 *(19%)*	41 *(32%)*	109 *(23%)*	174 *(37%)*
	£2	70 *(21%)*	**53** *(15%)*	38 *(29%)*	**25** *(19%)*	108 *(23%)*	**78** *(17%)*
Totals		340 respondents		129 respondents		469 respondents	

Table 3: WTP outcomes from the contingent valuation surveys

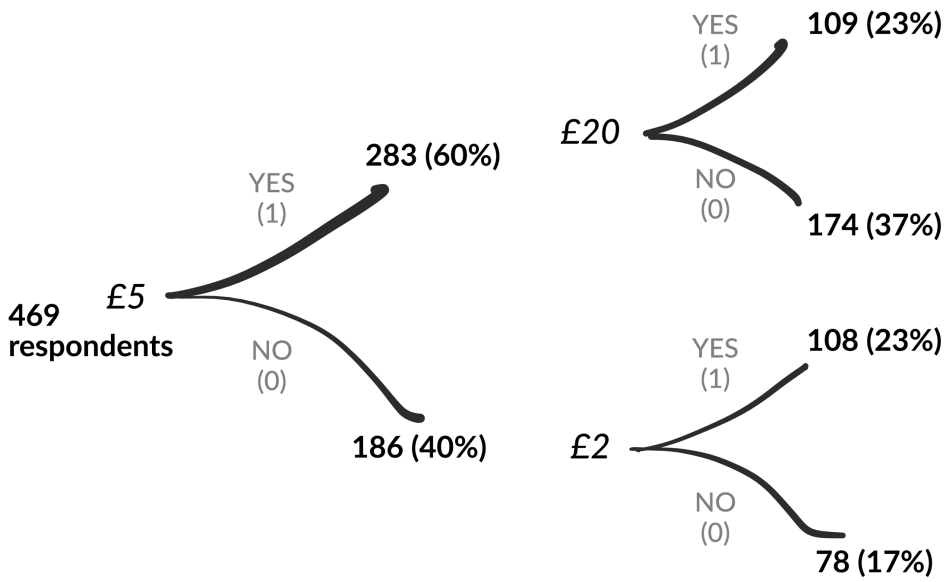

Figure 1: Visualising the double-bound dichotomous WTP results for the entire sample

Table 3 shows the final willingness to pay outcomes for both samples. If we look at the first dichotomous question, 64% of respondents at London Bridge were WTP £5 for the implementation of more public art in their local area compared to 51% at Whitechapel. Looking at the upper level of the second dichotomous question, 25% of the whole sample at London Bridge were WTP at the £20 level compared to 19% in Whitechapel. Looking at the lower level of the second dichotomous question, for those who were not willing to pay £5, 21% of respondents at London Bridge were WTP £2, whereas there was a higher percentage at Whitechapel of 29%. Figure 1 shows a visual representation of the combined WTP outcomes for both samples. Overall, 60% of the entire sample was WTP at the £5 level and 87% of the entire sample was at least WTP something, with 17% not WTP anything at all.

4.4. Definition and sample statistics of covariates in final model

The focus of our research is not to assess why there are differences in WTP for public art between London Bridge and Whitechapel. Whilst we recognise that there were differences in socio-economic factors, engagement and attitudes towards culture and the arts between the respondents in both locations based on the summary statistics of our contingent valuation, we chose to combine the data for Whitechapel and London Bridge together for the final regression[1]. Because we are interested in whether all Londoners want these types of initiatives in their area, a combined sample means that that a random respondent from our sample is closer to a random Londoner.

As recommended by Sarkhel (2015), WTP at the £5 level (the first dichotomous question) was used at the dependent variable as it contains most of the WTP data. Moreover, Buckland el at (1999) recommend including the bid amount for each respondent as a covariate in the regression model. After combining both samples, many of the socio-economic covariates such as age, race, education, being married, and health were statistically insignificant when regressed against the dependent variable, WTP £5 for public art initiatives in the local area. Therefore, these were not included in the final model. SPSS statistical software programme was used to perform the binary logistic regression.

Changing categorical variables to dummy variables

Many of the covariates were binary, meaning that the answer to the questions were either yes or no (coded at 1 and 0, respectively). However, questions about age, income, health and many of the engagement questions were scalar, therefore, they were discrete categorical. Yet, when performing a binary logistic regression with the discrete categorical data that was also ordinal, there were issues with statistical significance of the coefficients. Therefore, some of the categorical discrete data was turned into binary dummy covariates.

In particular, the following variables—*Income High, Income Low, Frequent Art Visitor, Likely to see public art in the future, High Enjoyment, Low Enjoyment*—were turned into binary dummy variables having been discrete categorical. Income High ($x2$): if a respondent reported their income as above £30,000, a separate dummy variable was created where the respondent was given a 1, otherwise a 0. Income Low ($x3$): if a respondent reported their income as below £15,000 they were given a 1, otherwise a 0. Frequent Art Visitor ($x8$): if a respondent reported that they visited an art museum/gallery more than 3 times in 2017 they were given a 1, otherwise 0. Likely to see public art in the future ($x11$): if a respondent rated that they were "very likely" to see a public art installation in the future, they were given a 1, otherwise a 0. High Enjoyment ($x12$): if a respondent rated that they "highly enjoyed" the present art installation, they were given a 1, otherwise a 0. Low Enjoyment ($x13$): if a respondent rated that their enjoyment of the present art installation as below 2, they were given a 1, otherwise a 0.

A multicollinearity check was carried out using the Pearson's coefficient matrix: the majority of covariates were not correlated to each other. Table 4 below summarises the final covariates used in the model.

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[1] In fact, after performing separate logistic models on both samples sizes, the covariates for the Whitechapel data were not statistically significant. Perhaps this is because the sample size for Whitechapel (129 respondents) was too small.

Variables	xi	*Definition*	*Mean*	*St. Dev*
Bid amount	$x1$	Bid amount offered to the respondent's (£5; £2 or £20)	£5 (median)	--
Income High	$x2$	Dummy for the respondent's income over £30,000 (0=no; 1=yes)	0.514	0.500
Income Low	$x3$	Dummy for the respondent's income below £15,000 (0=no; 1=yes)	0.145	0.352
Children	$x4$	Dummy for variable for dependent children under 16 years (0=no; 1=yes)	0.520	0.500
Lives in London	$x5$	Dummy for living in London (0=no; 1=yes)	0.838	0.369
Lives Locally	$x6$	Dummy for whether the respondent lived locally (0=no; 1=yes)	0.352	0.478
Local Business	$x7$	Dummy for *if the respondent is a local business* (0=no; 1=yes)	0.343	0.475
Frequent Art Visitor	$x8$	Dummy for if the respondent frequently visited art museum or galleries this year (0=otherwise; 1=more than 3 times)	0.531	0.500
Non-frequent Art Visitor	$x9$	Dummy for if the respondent did not visit any art museum or gallery this year (0=otherwise; 1=did not visit)	0.183	0.387
Visit Local Institution	$x10$	Dummy for *if the respondent visited the local major art institution (Tate Modern or Whitechapel Gallery)* (0=no; 1=yes)	0.582	0.494
Likely to see public art in the future	$x11$	Dummy for *high likelihood that the respondent is to visit a public art installation in the future* (0=otherwise; 1=rated as 5 'very likely')	0.343	0.476
High Enjoyment	$x12$	Dummy for *respondents that highly enjoyed the present art installation* (0=otherwise; 1=*rated at 5 'highly enjoyed')*	0.478	0.500
Low Enjoyment	$x13$	Dummy for *respondents that did not enjoy the present art installation* (0=otherwise; 1=*rated at 2 or below)*	0.228	0.420
Subjective Wellbeing	$x14$	Dummy for *whether regular installations of public art would increase life satisfaction* (0=no; 1=yes)	0.842	0.365

Table 4: Determinants of WTP - list of variables used in the final model. **Blue** for socio-economic variables and **orange** for engagement variables

4.5. The binary logistic regression model – estimation of results

Variables	*β*	*Coefficients*	*St. Errors*	*t-values*	*Odds-ratio Ex(B)*
Bid amount	$\beta 1$	–7.066***	1.001	-7.059	0.001
Income High	$\beta 2$	0.905**	0.366	2.468	2.471
Income Low	$\beta 3$	0.724	0.475	1.548	2.063
Children	$\beta 4$	0.840***	0.328	2.557	2.316
Lives in London	$\beta 5$	1.035**	0.465	2.229	2.816
Lives Locally	$\beta 6$	1.059***	0.392	2.701	2.885
Local Business	$\beta 7$	0.910**	0.381	2.391	2.484
Frequent Art Visitor	$\beta 8$	1.837***	0.366	5.018	**6.280**
Non-frequent Art Visitor	$\beta 9$	1.095**	0.480	2.281	2.989
Visit Local Institution	$\beta 10$	1.495***	0.363	4.113	**4.458**
Likely to see public art in the future	$\beta 11$	-0.226	0.391	-0.578	0.798
High Enjoyment	$\beta 12$	0.753*	0.412	1.826	2.122
Low Enjoyment	$\beta 13$	0.898*	0.469	1.917	2.455
Subjective Wellbeing	$\beta 14$	2.154***	0.477	4.518	**8.621**
Constant		–4.625	0.686	–6.744	
Wald statistic		20.215			
(p-value)		0.000			
Number of observations		469			
Log-likelihood		269.610			

Table 5: Output of the binary logistic regression model. Significance levels *10%, **5%, ***1%

4.6. Discussion of the coefficients and how they affect WTP

Table 5 above shows the results of the logistic regression estimation. The coefficients of the basic equation are in the third column. All but two covariates are statistically significant at the 10% level – **Income Low** and **Likely to see public art in the future** will not be included in the final equation. The bid amount had a negative coefficient because as the bid offer increases the likelihood of WTP should decrease; this is constant with the theory (Buckland, 1999).

Generally, the more engaged a respondent was towards arts and culture the more likely they were WTP relative to their socio-economic characteristics.

Engagement covariates
The variable that influenced WTP at the £5 level the most was **Subjective Wellbeing**. We asked respondents, "*Imagine that a Private Organisation decided to support public art installations in this area once every three months, each installation lasting one week. How would this initiative affect your level of life satisfaction?"*. We can interpret the results of the regression output as follows: respondents who reported an increase in life satisfaction to the above question were 8.6 times more likely (looking at their odd-ratio in column 6) to pay for a public art installation in their local area.

The next variable that was strongly associated with WTP at the £5 level was **Frequent Art Visitor**. Respondents who had visited an art museum or gallery more than 3 times this year were 6.3 times more likely to pay for a public art installation in their local area. Interestingly, though, we found significant evidence to suggest that even non-frequent art visitors were also willing to pay for a public art installation in their local area as shown by the positive coefficient. Additionally, respondents that had visited the local major art museum this year we 4.5 times more likely to pay than those who had not.

Whether or not a respondent enjoyed the current installation did not affect their willingness to pay: those who did not enjoy the current installation were equally as likely to pay for a future public art installation than those who did highly enjoyed it. The significance level of these covariates is at the 10% level rather than the 5% or 1%, however, this finding suggests that respondents who did not enjoy the current installation were still willing for more public art in their local in the future. We can interpret this insight such that Londoners would like to have a choice or opinion in the type of public art that is installed in their local area in the future; this supports some of our earlier ideas.

Finally, we asked respondents how likely they were to view a public art installation in the future (4 rated as highly likely). We thought this variable would positively influence respondents' willingness to pay, but the variable was statically insignificant at the £5 level, and therefore, will not be included in the final equation.

Socio-economic covariates
Looking at the socio-economic covariates, it was expected that people with a higher income would be more WTP but our results show that this is might not necessarily be the case. Respondents with an income above £30,000 were equally as likely to pay as those with an income below £15,000, based on the similar odds-ratios of the I**ncome High** and **Income Low**. However, the strength of this insight is questionable as the **Income Low** variable was insignificant at the 10% level.

Respondents with children were 2.3 times more likely to pay compared to those who don't have children and this result was highly significant. People who lived in London were 2.8 times more like to pay than those who do not, and respondents who lived locally are 2.9 times more likely to pay than those who do not live locally. We can interpret these findings in such a way that respondents who live locally and who have children would like to see more public art in their local area based on data collected in Whitechapel and London Bridge. Future research could test to see if this trend is consistent across other districts of London. There is some evidence to suggest that local businesses would be willing to pay for more

public art but we did not collect any information on which types of business these were, so elaborate conclusions about this result cannot be drawn.

4.7. Testing the model fit

The classification table 4 with the model covariates correctly predicted 88.5% of the outcomes; the classification table without covariates is at 60.5%. This shows that our covariates improved the degree to which our model could predict WTP. The Omnibus test of the model coefficients produces a chi-squared value of 358.5 at 14 degrees of freedom and is significant at 1%, meaning that our model and covariates will be good predictors of WTP. Nagelkerke R square is at 72.4% giving us an idea of how much the variance in WTP is explained by the covariates; there are still some omitted covariates which could predict WTP further. The Hosmer and Lemeshow test has a significance level of 97.2%, and the H&L contingency table values predicts that the model will fit a random sample with 99.5% accuracy (45.771 out of 46 people).

Classification Table a,b

			Predicted		
			WTP £5		**Percentage Correct**
Observed			**0**	**1**	
Step 0 (a)	**WTP £5**	**0**	*0*	*186*	*0*
Without covariates		**1**	*0*	*283*	*100*
					60.47
Step 1 (b)	**WTP £5**	**0**	*157*	*28*	*84.86*
With covariates		**1**	*26*	*257*	*90.81*
					88.46

Table 6: Classification of the logistic regression model with and without covariates

Test	Value
Model Chi-square	358.5019612
df	14
Sig.	0.00
-2 Log likelihood	269.61
Nagelkerke R Square	0.724
Hosmer and Lemeshow Test	0.972
Hosmer and Lemeshow Chi-square	2.25
Hosmer and Lemeshow Contingency Test Values	45.77 predicted vs 46 observed (0.995)

Table 5: Statistical tests of the logistic regression model from the SPSS output

4.7. The final linear equation:

$$\log\frac{E(y_j)}{1-E(y_j)} = -7.066 * \text{Bid accepted}_j + 0.905 * \text{Income High}_j + 0.724 * \text{Children}_j + 1.035 * \text{Lives in London}_j + 1.059 * \text{Lives Locally}_j + 0.910 * \text{Local Business}_j + 1.837 * \text{Frequent Art Visitor}_j + 1.095 * \text{Nonfrequent Art Visitor}_j + 1.495 * \text{Visit Local Institution}_j + 0.753 * \text{High Enjoyment}_j + 0.898 * \text{Low Enjoyment}_j + 2.154 * \text{Subjective Wellbeing}_j - 4.625$$

4.8 Extension of the model

WTP estimation

Often, the motivation for undertaking a CV is to derive economic values from the data. There are a variety of ways to calculate WTP; for DB-DC data, it is generally carried using first responses only (Whitehead, 2002; Herriges and Shogren, 1996). For this paper, Hahnemann's (1989) method is adopted using the covariate coefficients and means from tables 3 and 4, respectively.

$$Mean\ WTP = \frac{(\beta_0 + \sum \beta_i \overline{x_i})}{\beta 1}$$

$$Mean\ WTP = \frac{-46.95}{-7.066} = \textbf{£6.64}$$

Buckland et al (1999) offer a more precise method to estimate mean WTP using $\hat{y}$ (predicted probability of the logistic regression) and the recorded bid value offered to each respondent. The authors direct the researcher to evaluate the mean $\hat{y}$ prediction at each bid level including zero WTP (£0, £2, £5, £20) and to fit a logistic curve to these data points; an online tool called My Curve Fit was used to fit the curve. Mean WTP is given when $Prob\ (0.5)$ = $Mean\ WTP$ = **£4.73**. This is shown by Figure 3 in the appendix. However, the result obtained from the Buckland et al's (1999) method for this study should be considered carefully. The authors had CV data from 1820 responses across 21 bid levels (compared to 4 in this study), additionally, they used a bootstrapping algorithm to fit a precise curve, and therefore, their results are much more reliable.

4.9. Results Conclusion

In conclusion, we can accept the null hypothesis that the covariates do influence Londoners willingness to pay for more public art in their local area and the most important factors that influence the extent Londoners value the experience of visual art integrated in their city are whether they have children, if they lived locally to our study, their perceived subjective wellbeing of hypothetically having frequent public art installations in the future, whether they are frequent art visitors and whether they had been to a major local arts institution. The model has also passed a range of statistical tests showing that the covariates are good predictors of WTP. Finally, the mean WTP estimated from the CV data lies between £4.73 and £6.64, given the methods used in the paper.

Section 5: Discussion and Conclusion

We see the results of this study very positively. Over 83% of people interviewed are willing to financially support public art projects in cities and the likelihood increases when these people live locally. Moreover, 84% of all respondents said that more art in cities would improve their wellbeing. Additionally, the While these results are just based on two projects, we see this as a very positive indicator to public support towards art initiatives in future cities.

The main motivations of this paper are to shine a light on the value of public art initiatives. The smart city concept is inclusive and based on cross-pollination (Ramaswami et al, 2016). Public art projects are representative of this complexity as they should involve art experts, urban planners, economists, sociologists, political scientists as well as citizens. It is important to understand the economic value of public art initiatives within smart cities context because it will allow policy makers, urban planners and developers to implement such initiatives in the future. The dialogue must be open and eclectic in its methodological approach. It calls for a different, much closer, relationship between cultural institutions and empirical researchers than has been the case to date.

This study is here to encourage economists to work and value public art projects. There is a clear lack of engagement in the cultural and creative area from economists (Bakhshi et al, 2015). The American Economic Association uses a system of codes to classify different scholarly contributions in the area of economics. ‘Cultural economics’ appears in category Z ‘Other Special Topics’. We are only aware of a handful of economists working on culture in universities in the whole of the United Kingdom. However, this study showed a demand which can be expanded to all future cities and worth studying while the public art value reveals itself to be key to citizens.

Hopefully this study is also encouraging to more cultural institutions to partner up with data analysts to lead stronger research into their audiences, the impact these projects generate and the support that they may get from them. Historically, the unwillingness of cultural institutions to engage with the tools of economics has resulted in little progress in valuing art projects, specifically public art ones. No doubt this is in part due to the unfamiliarity at using the language of consumer surplus and willingness to pay and we hope this study helps making it a more familiar method.

We also wish that this study could be the start to a long-term aim of systematically building a rigorous body of evidence which can be used to understand the value of public art projects in its various forms. In the near future, we could further this study with a survey defining more strongly the type of art that city audiences are willing to pay for and we are also planning to analyse the data of most real estate in cities, and the variable of values according to them being near a cultural hub or public art project. This understanding, in itself, could foresee a change in public support, willingness to pay and the number of projects in our future cities.

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