International Journal of Business and Society, Vol. 15 No. 2, 2014, 303 - 320

PRICE AUCTION AND REGULATION IN EXPERIMENTAL BUILT HERITAGE CONSERVATION MARKET

Kean-Siang Ch'ng♣
Universiti Sains Malaysia

Suet-Leng Khoo
Universiti Sains Malaysia

Yoke-Mui Lim
Universiti Sains Malaysia

ABSTRACT

This paper applied methods from experimental economics to allocate a limited amount of financial funds to conservation efforts of heritage house owners in George Town, Penang. We applied and compared two procurement auction mechanisms borrowing elements from Economic theory. In the first treatment, the conservation price was regulated and house owners were encouraged to submit their proposed works for grant consideration. The disbursement of the grant was made based on the number of works. In the second treatment, the conservation works were regulated and house owners were encouraged to submit their conservation price. The main findings illustrated that the market performance of the second mechanism was more cost effective than the first mechanism. This was because house owners in the first mechanism strategically gamed the auction by submitting low conservation efforts. As the result, conservation efforts were significantly overpaid. The results suggested the use of a mechanism which combined government's intervention on the type of conservation efforts and price allocation through market competition in heritage conservation policy.

Keywords: Built Heritage Conservation; Conservation Works; Auction; Asymmetry Information; Experiment.

1. INTRODUCTION

Ownership of a built heritage site brings a number of benefits. These may be tangible (e.g., commercial use) or intangible (e.g., enjoyment of its historical and aesthetic value) in nature. Such benefits extend to the wider community when these historical buildings provide a tangible link to the community's socio-cultural and religious past. In some cases, these private benefits should provide adequate incentives to the owners to undertake appropriate conservation

♣ Corresponding author: Department of Economics, School of Social Sciences. University Sains Malaysia. Minden Campus, Penang. 11800. Malaysia. Tel:+6046534623. Fax: +6046530918. E-mail:cks@usm.my

efforts. However, in the event when the private benefits are lower than the private costs of maintaining the building and absence of any market mechanism to incentivize conservation effort, the owners would not undertake as much conservation efforts as the society as a whole would desire.

The under-provision of conservation efforts on heritage shops and residential houses in George town, Malaysia is mainly due to its low potential capital return. The historical houses were built before World War II and are located in a core zone (109.38 hectares with 2344 houses) and a buffer zone (150.04 hectares 2321 houses)[1]. The repeal of Rent Control Act (1966)[2] in 1997 combined with selective urbanization policies in other parts of Penang Island caused many residents to move from inner city George Town to new townships that offered better quality of housing and facilities. Many houses were left vacant and heavily dilapidated due to oversupply of these pre-war houses and depopulation from the inner city of George Town (Lee et al., 2009; Nor' Aini et al., 2007). High restoration costs, complicated conservation guidelines, condition of the buildings, uncertainty of the material costs and market value of the house have contributed to the low private investment in heritage buildings. The study conducted a preliminary interview with some of the house owners and tenants, found that the restoration of the heritage houses were low due to reluctance of owners and renters to invest in heritage conservation effort[3].

As representative of the wider community, the government may intervene to mitigate this market failure by incentivizing efforts which are not taken into account by the private owners (Morris, 1992; Peacock & Rizzo, 2008; Schuster, 1997; Australian Government Productivity Commission, 2006). Conservation grants are the most common form of assistance that is intended to offset the conservation expenses. Ideally, the provision of financial assistance should be well targeted to ensure the right recipients.

The Penang Heritage Conservation Grant is based on outcomes. House owners are encouraged to decide on their own conservation works best suited to their house and cost structure. The evaluation of the grant is based on the following criterion, namely, 1) contribution to the outstanding universal value; 2) contribution to a sustainable city and 3) improvement towards social and economic conditions. Although‘roofing and facade' are specified as main elements prioritized for conservation by Think City Sdn Bhd (conservation arm of the government), house owners are encouraged to submit applications that involve more conservation works. Grant will be disbursed based on the number of works, the intended use of the building and the contribution to the above mentioned criterion.

---

[1] As reported in the “Draft Special Area Plan. George Town. Historic Cities of the Straits of Malacca” (2011), pp. 2-20–2-22 (ungazetted).

[2] The Rent Control Act (1966) introduced after World War II aimed to control rents and ensure the availability of affordable housing.

[3] Low investment return and economic activities in both core and buffer zones are the main reasons for both owners and renters/ tenants not to invest in conservation efforts.

While there are potential benefits to incorporating outcome payments and relying on market to encourage conservation, there are also a range of potential problems and costs that need to be considered. There are significant hidden action problems due to uncertainty about the relationship between the heritage conservation activities and the final outcome. Appropriate conservation activities may be detailed, ongoing and difficult to monitor. It is well known in the literature that such allocation procedure does not overcome the information asymmetry between sellers (i.e., house owners) and buyer (i.e., conservation agency or government) (Ferroro, 2008; Hart and Latacz-Lohmann 2004; Choe and Fraser 1998). One of the solutions suggested in the literature is classifying and homogenizing sellers in a procurement auction. Since the hidden action problems mainly arise from lack of reliable tools to quantify ex post conservation values (Pollock-Ellwand, 2011; Dutta & Husain, 2009; McCarthy, 2011; Australian Government Productivity Commission, 2006), conservation agency can mitigate this by homogenizing sellers/heritage buildings and identifying type of conservation efforts/plans (Che, 1992; Dasgupta & Spulber, 1990; Schuster, 1997) (the justification of homogenizing heritage buildings in George Town is explained in the next section). To avoid sellers' strategic behavior, in which case the owners can tailor their conservation effort so as to maximize the difference between the grant and their true conservation costs, often at the expense of environmental gains (see, for examples, Cason et al., 2003; Stoneham et al., 2003; Cason & Gangadharan, 2004; Moscarini & Ottaviani, 2001; Sable & Kling, 2001). To avoid this, the payments can be based on competitive bidding. Bidding among owners may exert pressure on the submitted price, which causes sellers to submit true conservation cost (Lohmann & Schilizzi, 2005; Cason & Gangadharan, 2005; Stoneham et al., 2003; Chan et al., 2003).

This paper intends to study two quasi-market mechanisms when there are hidden action and hidden cost problems. In the first mechanism, government specifies type of conservation works that house owners are required to carry out. The government can tailor the chosen conservation works towards the criteria and its policies. The house owners will then have to compete among each other based on conservation price. It is referred to as PRICE treatment throughout the paper. In the second mechanism, the government can regulate the price of conservation but not the conservation works. The pre-determined conservation price represents the reserve price of the government (Dana Jr & Spier, 1994; Milgrom, 1989).. Given the price, the house owners will have to compete among each other based on number of conservation works carried out. It is referred to as CONS treatment in the paper.

The study compares the performance of the two mechanisms based on cost efficiency and conservation works carried out by the house owners. The results indicate that conservation efforts are bought not at the cost in the two mechanisms. House owners in CONS treatment are paid significantly higher than house owners in PRICE treatment. The experimental result also shows that conservation effort, which is represented as number of conservation works carried out, is lower in CONS than in PRICE treatment. This is mainly due to house owners in CONS treatment game the auction by submitting lower conservation works than in PRICE treatment.

The present paper is outlined as follows: section two explains the justification of homogenizing heritage buildings from the George Town heritage conservation perspective, section three explains the experimental methods and procedures, section four focuses on the results, section five discusses the policy implications of the study and section six concludes.

2. HOMOGENIZING HERITAGE BUILDINGS: THE CASE OF GEORGE TOWN

The justification of homogenizing heritage buildings is applied with the understanding that 'groups of buildings' in the same block share the same historical and architectural styles/ significance. The only differentiating factor would be the levels and magnitude of dilapidation of each individual building within the same block. This method of grouping buildings together is in line with the definition provided in Article 1 of the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage. According to Article 1, 'groups of buildings' are considered as "cultural heritage" if they constitute "groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of history, art or science."[4]

To further consolidate that 'groups of buildings' (within the same block/locality) can be perceived as a 'homogeneous entity', we can refer to the principles and standards of conservation and preservation of historic buildings. For instance, in the process of restoration of historic buildings, "Replication of the missing or deteriorated element is appropriate only if there are good historical, physical or pictorial records of what the missing element looked like, or similar architectural elements are available from other buildings or structures of the same period."[5] Here, obviously, the mention of "…similar architectural elements from other buildings…" simply refers to the (similar) architecture styles of adjacent or adjoining buildings within the same block/groupings. To add, these adjacent or adjoining buildings (within the same block) also qualify to be regarded as structures that are normally built and constructed in the same period, thus, validating the method of 'homogenizing heritage buildings' as proposed in this study.

Similarly, these conservation and preservation principles are also applicable to the historic buildings in George Town, Penang. According to the draft Special Area Plan (SAP) of George Town, there are generally six (6) basic styles of shophouses found in George Town, namely, 1) Early "Penang" Style (1790s-1850s), "Southern Chinese" Eclectic Style (1840s-1900s), "Early Straits" Eclectic Style (1890s-1910s), "Late Straits" Eclectic Style (1910s-1930s), Art Deco Style (1930s-1960s) and Early Modern Style (1950s-1970s). These six shop house styles are categorized according to the (similar) era/period that they were built, their physical (architectural styles) as well as the types of traditional building materials used.

---

[4] Convention Concerning The Protection of the World Cultural and Natural Heritage by United Nations Educational, Scientific and Cultural Organisation (UNESCO); adopted by the General Conference at its seventeenth session, Paris, 16 November 1972.

[5] Singapore - Objectives, Principles and Standards for Preservation and Conservation, August 1993, published by Urban Redevelopment Authority (Preservation of Monuments Board).

Take for example the shop houses along Armenian Street, which are predominantly Category II buildings. Clearly, the groupings of shop houses in Armenian Street are similar in terms of their historical past as well as the architectural styles of the buildings. In terms of history, based on a map of the early 1800s, Armenian Street was once known as Malay Lane due to the Malay kampong (village) settlement there (Khoo 2001). The name later changed to Armenian Street in 1808 when the Armenian trading community from Indian settled there for a while before relocating their residences to the suburbs. However, several houses on Armenian Street may have retained their legacy from the time when the Armenians lived there. Later, when the Straits Chinese arrived and took over the vicinity, these houses were converted to function like shop houses and they presumably reflected the same architectural styles, designs and building materials of that era.

Undoubtedly, the historical past of Armenian Street has inexorably influenced and shaped the architectural styles of shop houses there. Based on the findings and visual observation from the "Inventory of building in the Heritage Zone of George Town" (SAP, p. 3-7), more than half (approximately 55%) of the shop houses along Armenian Street bear a similar type of architectural style, that is, the "Southern Chinese" Eclectic Style. Buildings with this style are constructed during the 1840s-1900s. Based on the SAP's typology of 'Heritage Shop house Styles', this category of buildings are recognized as building that share the same architectural significance, physical appearance and also types of buildings materials used. These buildings are normally 2-3 storeys in height and they have simple to decorative facades. The eclectic features of these buildings are due to the Chinese influence manifested through carved timber doors, air vents, gable end and air-wells. At the same time, the louvered shutters and U/V-shaped terracotta roof tiles of these buildings reflect the European and Indian influence.

In sum, based on the above justification for the case of Armenian Street and in accordance with the abovementioned Article 1 of the UNESCO Convention, it can be concluded that groups of buildings (within the same block/locality) because of their similar historical past and common architectural significance have homogenized them as a single entity that contributes to the outstanding universal value stipulated in the SAP. This point concretely justifies the 'homogenization of heritage buildings' method proposed by this study.

3. EXPERIMENTAL DESIGN

The paper employs experimental method to examine the capability of the auctions to reveal cost information and their efficiency levels. House owners sell conservation projects that could contribute to cultural preservation in these auctions. The projects involve different conservation works, with different costs, and the agency as a buyer. The agency then ranks the conservation projects based on the price per conservation work. The agency allocates the fund to those who are successful until a fixed budget is exhausted. The paper uses these descriptions to motivate the experiments.

3.1. Participants

The study conducted eight experimental sessions, four sessions for each treatment, to investigate the market performance of the two quasi-market mechanisms. Each session lasted about 2

hours. The participants of the experiment were undergraduate students recruited from class announcements. They were from different faculties in Universiti Sains Malaysia and were not allowed to participate in more than one session. Table 1 shows the number of participants in each session in the two treatments.

Table 1: Number of participants in each treatment

Session	Treatments	
	CONS	PRICE
1	36 subjects	33 subjects
2	31 subjects	29 subjects
3	33 subjects	36 subjects
4	26 subjects	33 subjects

In the CONS treatment, the participants were required to submit conservation works/plans and conservation cost was determined by the "government". In the PRICE treatment, participants competitively bade for conservation cost and type of works were determined by government.

3.2. Experimental design and procedures

All the sessions were conducted in an experimental laboratory in the School of Social Sciences, Universiti Sains Malaysia. The experiment was conducted using experimental software z-tree (Fischbacher, 2007). Upon entering the lab, the participants were seated randomly and were given 7 minutes to read the instructions. Participants had to answer 5 questions related to the experiment in order to make them understand the experiment. The experimenter explained the rules and procedures and responded to any queries before the experiment started. Each treatment lasted about two hours, and the average income earned was RM20 at the exchange rate of $30,000 = RM1, which was paid to the participants privately immediately after the experiment.

Each session had 13 rounds in which participants could make different decision, and each round consisted of two stages. The first stage was a decision-making stage, in which sellers (i.e., house owners) had to make decision on how many types of conservation works to be carried out (in CONS treatment) and how much is the conservation cost to be submitted (in PRICE treatment).

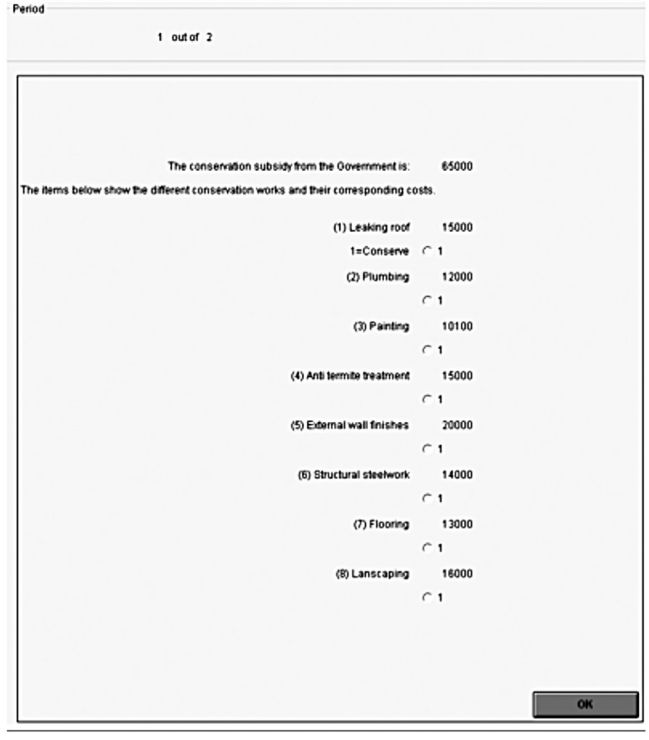
In this first stage, in the CONS treatment, conservation cost was given and the sellers could decide on type of conservation work from the list of 8 items. Government could choose an amount from the list $60,000, $65,000, $70,000, $75,000, $80,000 and $85,000 randomly to be given to the sellers. After knowing the grant amount, the sellers had to decide on types of work to be carried out. There were 8 different restoration works that sellers could choose such as: 1) leaking roof, 2) internal plumbing, 3) wall painting, 4) anti-termite treatment, 5) external wall finishes, 6) structural steelwork, 7) flooring and 8) landscaping. These are

among the usual conservation works encountered in built heritage conservation in Malaysia (Woon & Lim, 2010). Table 2 shows the type of conservation work and the corresponding cost. Each round, each seller had different conservation works and costs to reflect heterogeneity of sellers. Figure 1 shows the decision screen in stage one during the session.

Table 2: Type of conservation works and corresponding cost in both treatments

	Restoration works in both treatments	The range of conservation cost
1)	Leaking roof	12,000; 13,500; 14,500; 15,000 and 16,000
2)	Internal plumbing	11,000; 12,000; 12,300; 13,200 and 14,000
3)	Anti-termite treatment	8,000; 9,600; 11,500; 13,200 and 15,000
4)	External wall finishes	15,000; 18,000; 20,000; 22,000 and 25,000
5)	Structural steel work	14,000; 19,000; 22,000; 25,000 and 26,000
6)	Wall painting	9,000; 10,100; 12,300; 13,200 and 14,000
7)	Flooring	12,300; 12,500; 13,000; 14,300 and 15,000
8)	Landscaping	6,000; 8,000; 9,000; 11,000 and 16,000

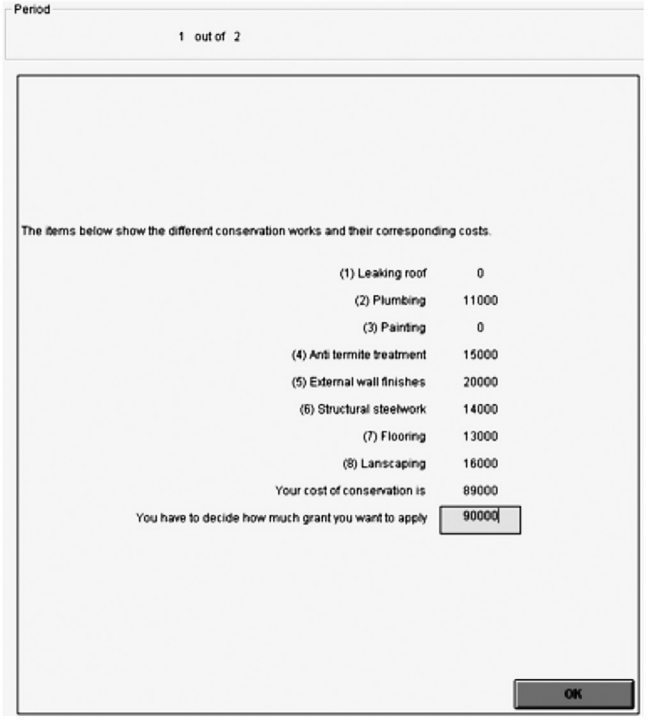
Figure 1: Screenshot of stage one in CONS treatment



In Figure 1, the first item on the screen was the amount of subsidy that is given by the conservation agency. The list follows the subsidy amount are the eight conservation works/ items and their corresponding costs. The subjects have to decide on which works/items they want to implement. They can click the empty box below each conservation work to indicate they agree to carry out the work. Total conservation cost is the summation of all the cost(s) of the chosen conservation work(s). Total conservation cost should not exceed the subsidy given by the government. The subjects then had to press the button "OK" on the screen.

In stage one in the PRICE treatment, the government had identified types of conservation works, and sellers were required to submit conservation cost. In each round, government randomly chose more than one items of conservation work from the same list in Table 2. After knowing the specified works, the sellers were required to submit a price to the government. Figure 2 shows the decision screen in stage one in PRICE treatment. In the figure, the conservation works/items were listed together with their conservation costs. Works which had conservation cost equal to zero indicated that the house owners did not have to conserve that particular item. Total conservation cost was indicated as the second last item in the list. Based on the conservation cost, the subject had to enter an amount in a small box. They then had to press the button "OK".

Figure 2: Screenshot in stage one of PRICE treatment



In stage two, in both treatments, all the submissions were ranked by the conservation agency based on the lowest cost per conservation work. The formula to rank the submissions is written as:

$$Index = \frac{Amount\ of\ grant\ submitted}{Total\ number\ of\ conservation\ works\ carried\ out} \quad (1)$$

The amount of grant submitted in formula (1) referred to amount of subsidy given by the government. All the submissions from the bidders were ranked based on the formula. They were ranked from lowest to highest, and the rank was conveyed to the subjects together with the amount of subsidy given by the government and the profit earned for that particular round. The profit was calculated as amount of subsidy or grant given minus the total conservation cost. Submissions that were not successful had zero profit for that round to indicate they did not conserve the building. Submissions that had low index would be given the subsidy until total budget of one million was exhausted. The budget of the government was not announced to the subjects and the amount did not change throughout the experiments.

Table 3 shows the example of how the submissions were ranked and the grants were disbursed by the agency. For example in CONS treatment, subject (sub) number two, four and fourteen were ranked first because of their cost per work were the lowest among all the submissions. Those house owners who ranked below 10 in the ranking were successful. The total budget spent on the 13 successful house owners was $895,000. The two house owners ranked 14th were not successful, as the total budget of 1 million was not enough. The successful house owners received what they bade for and the profit was calculated as "Grant received" minus "True cost".

4. RESULTS

4.1. Market performance

The first market performance is market efficiency, which refers to the ratio of price paid per unit of conservation work derived from the auction, to the price paid per conservation work when the true conservation cost is known. If the ratio equals to one, it indicates that conservation efforts are bought at the cost. The ratio performs equally well to benefit ratio in standard conservation procurement auction when the environmental benefits are known (Cason & Gangadharan, 2004). The second performance measure is the sellers' profit, which is measured by actual cost paid minus true conservation cost. High profit represents that the conservation agency overspends relative to the true conservation cost. Lower sellers' profit is better from the agency's perspective. The third indicator is the number of conservation works carried out by the owners for a given subsidy level.

Figure 3 shows the average ratio for the two treatments according to conservation works. The ratio is higher in the CONS treatment than in the PRICE treatment, particularly when the number of works is low. The left portion of Table 4 shows the ratio for a given number

Table 3: Example of cost, grant and ranking in the CONS treatment

Period	Sub	Profit	# of works	True cost	Grant	Cost_per_ Work	Rank	Grant Received	Budget
1	1	0	1	16000	80000	80000	33	0	895000
1	2	4000	4	61000	65000	16250	1	65000	895000
1	3	28900	3	46100	75000	25000	9	75000	895000
1	4	17000	4	48000	65000	16250	1	65000	895000
1	5	15700	3	44300	60000	20000	5	60000	895000
1	6	0	2	36000	65000	32500	17	0	895000
1	7	0	1	16000	80000	80000	33	0	895000
1	8	0	2	23000	80000	40000	25	0	895000
1	9	15200	4	54800	70000	17500	4	70000	895000
1	10	0	1	11000	60000	60000	28	0	895000
1	11	0	1	9000	70000	70000	31	0	895000
1	12	0	1	12300	65000	65000	30	0	895000
1	13	20500	3	44500	65000	21667	7	65000	895000
1	14	13000	4	52000	65000	16250	1	65000	895000
1	15	0	2	30000	65000	32500	17	0	895000
1	16	30700	3	44300	75000	25000	9	75000	895000
1	17	0	3	37800	80000	26667	14	0	895000
1	18	0	2	25300	75000	37500	22	0	895000
1	19	0	2	36000	60000	30000	16	0	895000
1	20	0	2	30000	65000	32500	17	0	895000
1	21	0	1	16000	60000	60000	28	0	895000
1	22	0	1	9000	80000	80000	33	0	895000
1	23	20900	3	39100	60000	20000	5	60000	895000
1	24	35800	3	39200	75000	25000	9	75000	895000
1	25	0	2	34000	75000	37500	22	0	895000
1	26	0	1	12300	80000	80000	33	0	895000
1	27	0	3	44600	80000	26667	14	0	895000
1	28	25700	3	44300	70000	23333	8	70000	895000
1	29	37000	3	38000	75000	25000	9	75000	895000
1	30	33700	3	41300	75000	25000	9	75000	895000
1	31	0	2	26200	65000	32500	17	0	895000
1	32	0	1	13500	75000	75000	32	0	895000
1	33	0	2	32000	85000	42500	26	0	895000
1	34	0	2	27000	85000	42500	26	0	895000
1	35	0	2	27000	70000	35000	21	0	895000
1	36	0	2	27000	75000	37500	22	0	895000

Figure 3: Ratio of conservation price and true cost according to number of conservation works

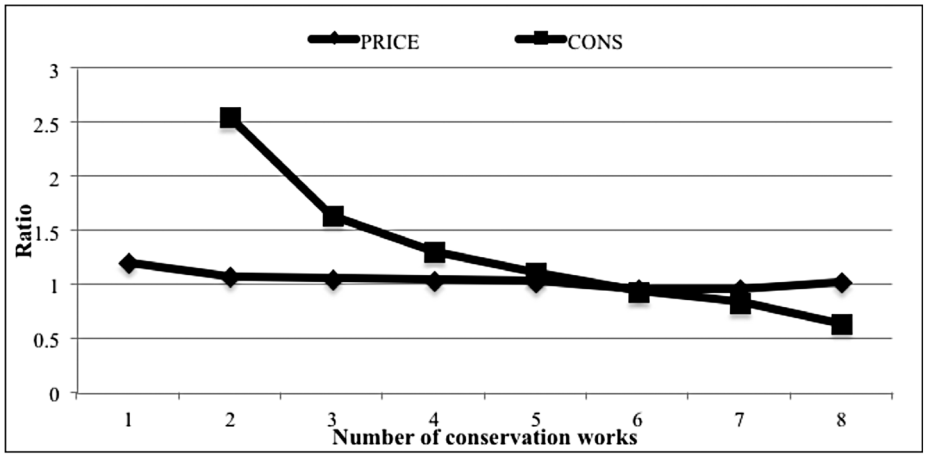


Table 4: Overall performance by number of works

	Average Ratio		Average sellers' profit	
Con works	**CONS**	**PRICE**	**CONS**	**PRICE**
1		1.2037		2,136.67
2	2.5490	1.0742	36,266.67	1,808.81
3	1.6413	1.0567	25,485.61	2,220.12
4	1.3045	1.0432	16,241.50	2,297.06
5	1.1135	1.0305	7,404.46	2,092.66
6	0.9413	0.9616	(5,122.73)	(3,567.21)
7	0.8351	0.9655	(15,800.00)	(3,740.96)
8	0.6387	1.0258	(42,350.00)	2,971.43

of conservation works. The lowest ratio in CONS treatment when the number of works is less than 6 is higher than almost all the ratios in PRICE treatment. Non-parametric Wilcoxon test strongly rejects the hypothesis of equal efficiency based on ratio (Z-statistics=36.127, p-value=0.0000).

The panel regression in Table 5 shows additional evidence whether the results are robust when controlling for experience (period) effect and subject effect. The panel regressions in the table are based on random effect error structure with subject as random effect[6]. The regressions include a dummy variable to account for the treatment effect, and the variable period to capture the differences in performance across periods. In columns one to three, the

[6] Hausman specification test reveals that random effect model is more suitable than fixed effect model.

positive and highly significant on the CONS treatment dummy variable indicates that ratio is higher in the CONS treatment than in PRICE treatment. The bidding behaviors are affected by number of conservation work and conservation cost. Column two of the table shows the effect of these two factors on the variable ratio. There is no significant difference between the two treatments concerning the effect of cost on the dependent variable. However, on average, the ratio becomes significantly lower in CONS than in PRICE treatment when the number of work increases. The ratio is significantly higher in CONS than in PRICE treatment by 0.36 when the number of work is lower than 5, but significantly lower in CONS than in PRICE by 0.28 when the number of work is higher than 4. This effect is shown in column three of the table.

The right side of Table 4 shows the highest sellers' profit in PRICE is lower than the lowest sellers' positive profit in CONS when number of work is lesser than 5. Non- parametric Wilcoxon test also strongly rejects the hypothesis of equal sellers' profit (Z- statistics = 14.086, p-value=0.0000). The panel profit regression in column 4 of Table 5 reveals conservation agency overpays house owners by $13962.72 in CONS compared to PRICE. In column 5 of the table, on average, sellers' profit drops by 0.67 for every unit increase in cost. The increase in cost is due to the high number of conservation works carried out by the sellers. Column 6 of the table shows that sellers in CONS earned significantly higher profit than sellers in PRICE when the number of conservation work is lower than 5, but the profit level drops significantly when the conservation work exceeds 4.

The third indicator is the amount of conservation works in the two treatments. Number of works provide useful indicator about the efficiency and capability of a mechanism to induce conservation work. High conservation works implemented by the owners indicate that the limited amount of budget can be spread out to more conservation works compared to when the number of work is low. Figure 4 shows the comparison based on a given amount of conservation grant. House owners in PRICE treatment, on average, implement more conservation works than owners in CONS treatment. The non-parametric Wilcoxon test rejects the null hypothesis that the number of conservation works is equal in the two treatments (Z-statistics = -2.691, p-value=0.0071).

4.2. Bidding behavior

The higher sellers' profit enjoyed by the house owners is due to high discrepancy in amount of grant submitted and the conservation cost in CONS treatment than PRICE treatment. Table 6 shows the difference in both treatments. This is mainly due to bidders in CONS treatment bid higher compared to bidders in PRICE treatment given a number of conservation works. Table 5, column 9 shows that the amount of grant submitted in CONS is significantly higher than PRICE treatment when the amount of work is less than 5, but the amount is significantly higher in PRICE treatment than CONS treatment when the number of work becomes higher.

Bidders are categorized into on margin and off margin bidders. Bidders who submit number of work higher than 4 are considered as off margin bidders whose conservation costs are too far above the average submitted grant from other bidders. On margin bidders are those who submit number of work lesser than 5. We investigate whether bidders from these two

Table 5: Panel regression for market performance indicators

	Ratio			Sellers' profit			Amount of grant submitted		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Cons	1.0416***	1.0941***	1.0540***	1050.902	2056.61	1576.008**	61271.04***	2056.61	47422.81***
	(66.50)	(52.67)	(68.33)	(1.34)	(1.57)	(1.94)	(52.81)	(1.57)	(52.62)
ID=1	0.2879***	1.2276***	0.3582***	13962.72***	52476.15***	17022.48***	10384.23***	52476.15***	22578.12***
	(24.03)	(33.87)	(26.99)	(22.12)	(22.88)	(23.30)	(11.02)	(22.88)	(26.45)
# of works		0.1397***			9078.92***			9078.92***	
		(5.92)			-6.09			-6.09	
ID*# of works		-0.0909***			-6616.08***			-6616.08***	
		(-3.08)			(-3.54)			(-3.54)	
True Cost		-0.00001***			-0.6662***			0.3339***	
		(-7.12)			(-6.84)			(-3.43)	
ID*True Cost		-0.00001***			-0.2187*			-0.2187*	
		(-5.39)			(-1.85)			(-1.80)	
# of works >4			-0.0551***			-2373.47***			31996.65***
			(-3.92)			(-3.06)			(-35.19)
ID * # of works>4			-0.2759***			-11943.82***			-25623.69***
			(-12.32)			(-9.67)			(-17.73)
Period	-0.0009	0.0009	0.0008	29.17	98.1	103.71*	24.79	98.11	0.4521***
	(-0.55)	(0.87)	(0.60)	(0.35)	(1.41)	(1.94)	(0.20)	(1.41)	(0.00)
χ^2	578.78	2812.1	1107.1	489.25	1389.59	798.98	121.41	3634.34	1504.71
N	1427	1427	1427	1427	1427	1427	1427	1427	1427

Notes: The dummy variable ID = 1 if CONS treatment and 0 if PRICE treatment. The variables "# of works = number of conservation works and dummy variable # of works >4 =1 if number of conservation works is more than 4 and zero otherwise. The numbers in the parentheses are z-values. *** is 1% significance level, ** is 5% significance level and * is 10% significance level. Ratio = $\frac{Submitted\ grant / \#\ of\ works}{True\ conservation\ cost / \#\ of\ works}$

The regressions take into account 631 obs in CONS and 796 obs in PRICE. Total 1427 bids were successful.

Figure 4: Profit level according to grant received in the two treatments

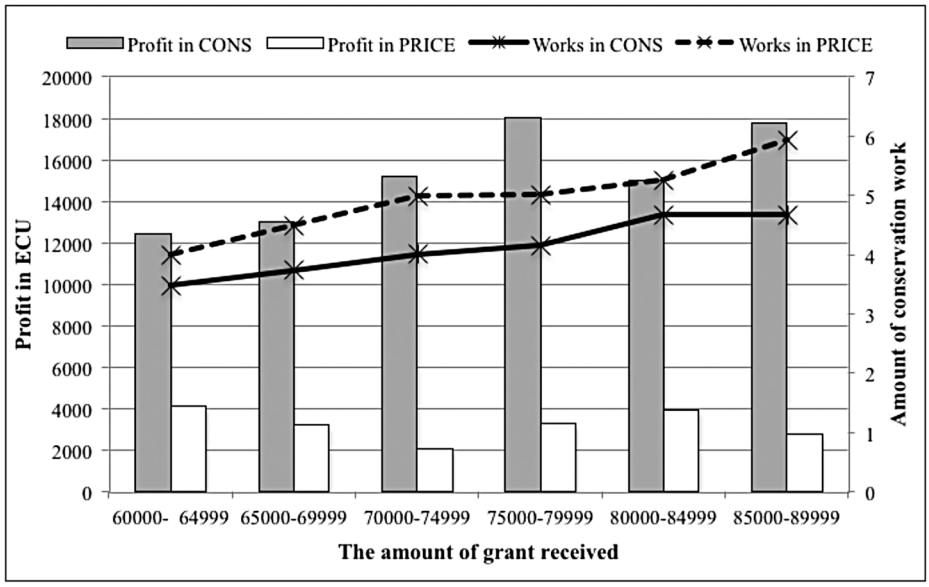


Table 6: Amount of grant submitted and true cost

		Amount of grant	True cost	# of works
CONS	Mean	71901.74	56759.59	4.11
	S.D	7450.142	12921.83	0.83
	Median	70000	55200	4
PRICE	Mean	61369.2	60177.39	4.24
	S.D	22512.64	20884.24	1.36
	Median	60950	58850	4

categories bid their true cost. The null hypothesis to be tested is the median of the submitted grant is equal to the conservation cost. In the CONS treatment, Wilcoxon sign rank test reveals that the hypothesis is rejected when the number of work is below 5 (Z-statistics = 27.685, p-value=0.0000), but the grant is not significantly different from cost when the number of work is higher (Z-statistics = -1.841, p-value=0.0656). The same test in the PRICE treatment reveals the submitted grant is significantly higher than cost regardless of the number of work (p-value=0.0000).

5. DISCUSSION AND CONCLUSION

Auctions allow conservation agency to use information about conservation plans and costs, which are otherwise hidden, to disburse limited resources efficiently in order to protect the built heritage. Under the circumstance when there is lack of conservation initiative and innovation from the private owners, the social cost of individual owners' action might be so high that it warrants government's intervention to offset the conservation cost and encourage private maintenance. It is important therefore to ensure that the agency's budget is well spent, and the study of the design and performance of an auction becomes critical.

The laboratory auctions reported in this paper compared two designs; 1) when the bidders submit conservation plan and compete with other bidders for conservation grant as opposed to a situation 2) when the bidders submit a conservation price and compete with other bidders. The experiments make the comparison based on cost efficiency and the number of conservation works carried out by the house owners. The offer functions indicate that the conservation efforts are not bought at the cost in the two treatments, conservation efforts are paid higher than the conservation costs. House owners in CONS treatment are paid significantly higher than house owners in PRICE treatment.

When controlling the amount of grant received by the bidders, the study shows that house owners carry out lower number of conservation work in CONS treatment than in PRICE treatment. This result in payment per conservation work is higher in CONS than in PRICE treatment. This is because bidders in CONS treatment game the auction by submitting low number of works in order to earn high informational rents. Bidders in the PRICE treatment face a tradeoff between higher surplus and lower probability of acceptance. Although on average bidders in this design earn positive profit, the competition of price imposes pressure on the amount of grant submitted by the bidders. The results indicate that the amount of sellers are overpaid relative to their costs is lower in PRICE than in CONS treatment.

The offer functions indicate that amount of grant submitted by the bidders is significantly higher than cost in the two treatments. In terms of truth telling, the two auction designs are not able to induce cost revealing bids particularly among on-margin bidders in the auctions. The submitted bids are significantly higher in CONS treatment than in PRICE treatment among on-margin bidders. In terms of engaging the bidders whose conservation costs are far above average bid, the CONS treatment is more capable in inducing bidders to bid their costs. This group of bidder bids close to their costs or sometimes bids lower than their costs in CONS treatment compared to PRICE treatment.

It is important to emphasize here that these conclusions are based on certain parameterization of conservation costs, conservation works and number of bidders in the auctions. The study chooses these parameters carefully to approximate the real condition in built heritage conservation, but these conclusions may vary in other situations. For example, conservation works may vary and they may involve extreme different costs. In such situations, house owners whose conservation costs are too high may not get the conservation subsidy although the

building is historically significant. Therefore, the efficiency ratio to calculate cost efficiency in the two auctions studied in this paper may not be agreeable from the conservationists' point of view. Intuition from the auction theory suggests that the degree to which bidders bid above costs in the PRICE treatment should depend on the number of bidders in an auction. This paper also does not study the monitoring and enforcement problems inherent in the heritage conservation. The implementation of the auction requires investigation of the monitoring issues to obtain maximum economic benefits.

REFERENCES

Australian Government Productivity Commission. (2006). *Conservation of Australia's historic heritage places. Productivity Commission*. Melbourne: Australia Government.

Cason, T. N., & Gangadharan, L. (2004). Auction design for voluntary conservation programs. *American Journal of Agricultural Economics, 86*(5), 1211-1217.

Cason, T. N., & Gangadharan, L. (2005). A laboratory comparison of Uniform and Discriminative Price auction for point source pollution. *Land Economics, 81*(1), 51-70.

Cason, T. N., Gangadharan, L., & Duke, C. (2003). A laboratory study of auctions for reducing non-profit source pollution. *Journal of Environmental Economics and Management, 46,* 446-471.

Chan, C., Laplagne, P., & Appels, D. (2003). *The role of auctions in allocating public resources*. Productivity Commission Staff Research Paper 31916.

Che, Y.-K. (1992). Design competition through multidimensional auctions. *RAND Journal of Economics, 24*(4), 668-680.

Choe, C., & Fraser, I. (1998) A note on imperfect monitoring and agri-environmental policy. *Journal of Agricultural Economics, 49*(2), 250-258.

Dana Jr, J. D., & Spier, K. E. (1994). Designing a private industry. *Journal of public economics, 53,* 127-147.

Dasgupta, S., & Spulber, D. F. (1990). Managing procurement auctions. *Information Economics and Policy, 4,* 5-29.

Dutta, M., & Husain, Z. (2009). An application of multicriteria decision making to built heritage. *The case of Calcutta. Journal of Cultural Heritage, 10*(2), 237-243.

Ferroro, Paul. J. (2008). Asymmetric information and contract design for payments for environmental services. *Ecological Economics, 65*(4), 810-821.

Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready made economic experiments. *Experimental Economics, 10,* 171-178.

Hartz, R., & Latacz-Lohmann, U. (2004). Combating moral hazard in agri-environmental schemes – a multi agent approach. *European Review of Agricultural Economics, 32*(1), 75-91.

Khoo, S. N. (2001). *Streets of George Town Penang* (3rd ed.). Penang: Janus Print & Resources.

Lee, L. M., Nor' Aini, Y., Lim, Y. M., Chang, S. F., Fang, H. L., Soon, L. T., Tan, S. F., Tang, W. J., & Tah, Y. S. (2009). *Urban Conservation as a real estate development strategy for revitalising the inner city of George Twon, Penang (Phase I)*. The National Real Property Research Coordinator Valuation and Property Services Department.

Lohmann, U., & Schilizzi, S. (2005). *Auctions for conservation contracts: A review of the theoretical and empirical literature*. Scottish Executive Environment and Rural Affairs Department Technical Report.

McCarthy, C. (2011). Re thinking threats to architectural heritage. *International Journal of Heritage Studies, 18*(6), 624-636. DOI:10.1080/13527258.2011.608373.

Milgrom, P. (1989). Auctions and bidding: A primer. *Journal of Economic Perspectives, 3*(3), 3-22.

Morris, M. (1992). *Innovative Tools for Historic Preservation*. Planning Advisory Service Report Number 438, American Planning Association, Washington DC.

Moscarini, G., & Ottaviani, M. (2001). Price competition for an informed buyer. *Journal of Economic Theory, 101*(2), 457-493.

Nor' Aini, Y., Lim, Y. M., & Tan, S. F. (2007). Urban conservation as a developmental strategy to revitalize real estate market: an analysis of property transactions in Georgetown, Penang. *Journal of Construction in Developing Countries, 12*(2), 43 – 61.

Peacock, A., & Rizzo, I. (2008). *The Heritage Game. Economics, Policy and Practice*. Oxford University Press.

Pollock-Ellwand, N. (2011). Common ground and shared frontiers in heritage conservation and sustainable development: partnerships, policies and perspectives. *International Journal of Sustainable Development and World Ecology, 18*(3), 236-242.

Sable, K. A., & Kling, R. W. (2001). The double public good: A conceptual framework for "Shared Experience" values associated with heritage conservation. *Journal of Cultural Economics, 25*(2), 77-89.

Schuster, J. M. (1997). Choosing the right tool(s) for the task. In J. M. Schuster, de monchaux, J. & Riley II, C. A. (eds.), *Preserving the built heritage: Tools for implementation* (pp 124 – 153). University Press of New England.

Stoneham, G., Chaudhri, V., Ha, A., & Strappazzon, L. (2003). Auctions for conservation contracts: an empirical examination of Victoria's Bush Tender Trial. The *Australian Journal of Agricultural and Resrouce Economics, 47*(4), 477-500.

Woon, W. L., & Lim, Y. M. (2010). Elemental cost format for building conservation works in Malaysia. *Structural survey, 28*(5), 408-419.