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Original article

Economic valuation of industrial heritage: A choice experiment on Shanghai Baosteel industrial site

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ABSTRACT

Industrial heritage has in recent years become an important component in land use and urban development policies. Yet, assessing the economic value associated with the preservation and reuse of industrial complexes remains an open question. In this paper, we apply a discrete choice experiment (DCE) method to assess the economic valuation of the Baosteel steel factory, an industrial brownfield in Shanghai planned to be transformed into an arts and entertainment hub. By eliciting the preferences of locals for the preservation and reuse of distinct attributes of the site, our findings suggest that the preservation of significant landmarks and the intangible component of the industrial site are the two most relevant attributes worth protection. Moreover, we add evidence on the relationship between respondents' economic preferences and their attitude toward the cultural value conveyed by industrial heritage by showing how distinct groups of respondents express different preferences for single attributes of the industrial heritage. The paper contributes to the heritage valuation literature by illustrating the implications and challenges of assessing the demand for industrial heritage rehabilitation projects.

1. Introduction

In several metropolitan areas, the de-industrialization of the urban economy has led to a growing number of development plans where the conversion of industrial areas poses a major trade-off in land use decisions between the demolition and construction of new buildings, on one hand, and the option of rehabilitation and refunctionalization of the unused structures to partly preserve the values and atmosphere of the industrial past [1,2].

In this context, industrial brownfields have been increasingly considered a new form of heritage asset, recognizing industrial archeology as a distinct field in historical and heritage preservation. According to the official international definition, industrial heritage refers to the remains of industrial sites, structures, complexes, areas, landscapes, and machinery, objects, and documents that provide evidence of past or ongoing industrial production processes [3,4]. More importantly, the academic and policy debate has emphasized the potential of the conservation and adaptive reuse of industrial heritage by transforming these sites as a catalyst for urban regeneration [5–7] or resource for tourism attractiveness [8–11].

Despite such appreciation, there has been little research on assessing the economic value associated with the preservation and reuse of industrial complexes. Economic valuation techniques have been commonly applied to estimate the market and non-market benefits of preserving and rehabilitating cultural heritage, such as monuments, archeological sites, or historic urban cores [12,13]. However, in the context of industrial heritage, scholars have mainly focused on multi-criteria approaches to assessing the relative importance of heritage values and the often-conflicting preferences expressed by diverse groups of stakeholders over the preservation and reuse of different characteristics of industrial sites [14–17]. These works develop theoretical and methodological frameworks to address the complexity of allocation decisions of resources in industrial heritage conservation. However, from an empirical viewpoint, they have been mainly applied by eliciting preferences from experts' panels without considering alternative techniques to estimate the demand for industrial heritage rehabilitation. Similarly, little is known about the preferences of residents or potential visitors toward the preservation of distinct attributes of industrial heritage to maintain and convey its authenticity and cultural value.

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Among valuation techniques of non-market goods, choice experiment is particularly suited to analyze industrial heritage as it allows to assess different adaptive reuse scenarios to measure the demand for preservation or rehabilitation of the physical integrity of industrial complexes. As a direct stated preference method based on welfare economic assumptions, respondents are asked to choose between one or more alternatives involving changes in one or more of the alternatives' attributes.

In this paper, we adopt the choice experiment method to elicit the preferences of locals for the preservation and reuse of distinct attributes of the Baosteel industrial complex located in Shangai, and estimate marginal utilities. The site represents one of the largest industrial brownfields in the world located within a metropolitan area and is of particular interest for addressing the conservation and reuse challenges involving industrial heritage connected to steel-making processes. For example, while the majority of industrial heritage sites inscribed into the UNESCO World Heritage List refer to mining landscape, manufacturing plants or stand-alone steel structures, only one site (the Völklingen Ironworks in Saarland, Germany) share similarities with the study site for the typology of industrial heritage conserved. Moreover, the Chinese context represents an interesting case study to explore the benefits of the conservation of heritage values in land use decisions concerning industrial estate transformation processes [18]. Since the 1980s, China has experienced rapid industrial restructuring and sustained urbanization, making the conversion of industrial factories in central urban areas a key policy issue in regeneration strategies for several cities. In particular, according to recent surveys, the municipality of Shanghai hosts the most significant number of industrial heritage sites in the country [19]. While many industrial complexes have been converted into urban amenities, such as creative hubs, art districts or museums, the value attached by users of such spaces to the authenticity of specific attributes of the industrial heritage site (e.g. exterior, interior atmosphere or intangible components) remains quite an unexplored issue.

The main contribution of the paper is twofold. It represents one of the first attempts to apply choice modeling techniques for the economic valuation of industrial heritage. The findings obtained for the case of the Baosteel factory are helpful to illustrate policy implications and challenges to assess the demand of industrial heritage rehabilitation projects. At the same time, while attitudinal characteristics of respondents have been usually included in economic valuation studies, only recently there has been a growing interest in understanding their role in preferences for heritage conservation [20,21]. Following this line, the paper contributes from a methodological viewpoint to the literature on heritage valuation studies by exploring how individuals' attitudes toward the cultural values of industrial heritage may inform heritage management decisions to address the economic preferences of different groups of respondents for the conservation of distinct attributes.

The article is structured as follows: Section 2 discusses the research aims by contextualizing the case study of the Baosteel industrial site, Section 3 illustrates the choice experiment methodology and describes its application to the study site, Section 4 presents the results including respondents' characteristics, marginal utilities and determinants, Section 5 discuss the main findings and proposes policy and managerial implications. Finally, the last section draws a conclusion.

2. Research aim

The aim of this study is to assess the preferences of potential visitors to the new entertainment and artistic hub in preserving the industrial heritage attributes of the Baosteel industrial site in Shanghai.

Shanghai is an important industrial city in modern China. Historically, the city was the breeding ground for the modern industrialization of China in the 1850s, but at the same time, it has been one of the first urban settings to face deindustrialisation in the 1980s.

Significantly since 1990, the city's economic structure has been rapidly transformed from traditional industries to newly developed industries and the service industry. Consequently, many industrial enterprises in the inner city were closed down and relocated outside of the metropolitan area as the city's functions and spatial structure evolved in accordance with urban development and industrial restructuring initiatives proposed by the municipal government.

The relocation of polluting and labor-intensive industries towards the marginal areas of the city left a large quantity of empty industrial factories and warehouses [22]. Furthermore, recreating the city's vitality while preserving the historic environment has become a primary challenge facing the municipal government in planning practices [23].

The new policy issued in 2016 encourages the revitalization of existing industrial land in the "lease priority, (land use right) transfer" model. Enterprises that obtain management rights by renting from *de facto* owners will obtain full land-use rights for up to 20 years. The 13th Five-Year Plan of Shanghai mentioned the need to vigorously develop the cultural industry and strive to build Shanghai into a national cultural center.[1]

In the Wusong area, known as the cradle of China's modern industry, most factories have been shut down or relocated due to pollution problems. The 26-square-kilometer site is planned to host the Wusong Smart City, an area with new activities, scientific and cultural innovation parks, business facilities, residential communities and amenities.[2]

As illustrated in Fig. 1, our case study, the Baosteel Stainless Steel Co., Ltd, is located in the Wusong area, about 13 km away from the center of Shanghai (People's Square) and covers an area of 3.25 square kilometers. It used to be the Wusong Workshop of Riya Steel Factory, built in 1938, which evolved over the decades into a large complex hosting several steelmaking industrial processes (e.g. ironmaking furnaces, carbon steel manufacturing, hot and cold rolling etc.). As a result, the area today is characterized by more than 400 structures mainly dating back to the 70′s and 80′s, including industrial buildings, melting and casting facilities, warehouses, equipment, chimneys and conveyor pipes. Fig. 2 provides an illustration of some representative structures of the industrial complex.

In line with the urban renewal and development strategy of the area, in 2017, the factory stopped producing liquid iron in blast furnaces and has been finally closed in 2019, with plans for transforming the site into an artistic and entertainment hub hosting educational facilities, events, multimedia entertainment activities as well as arts and creative working and exhibition spaces.

3. Theory

As a novel type of heritage, the rehabilitation and adaptive reuse of industrial structures may be conceived as a form of cultural capital, which embodies and gives rise to simultaneously cultural and economic values [24].

Cultural values of industrial heritage refer to both its tangible and intangible components. According to Cossons [25], industrial

[1] The Plan is available here: http://www.shanghai.gov.cn/nw2/nw2314/nw2315/nw5827/u21aw1187223.html.

[2] For a detailed description of the project see: https://www.shine.cn/news/metro/2006281020/.

Fig. 1. Location of the plant of Baosteel Stainless Steel Co., Ltd.

heritage might have scientific and technological value in the history of manufacturing and construction, or have aesthetic qualities deriving from its architecture. These values are embedded in the structures and machinery of industrial landscape as well as in written documentation or in intangible records contained in human memories, traditions and customs. Similarly, Liu et al. [17] identify historic, technological, artistic and social value as the main dimensions for assessing the cultural significance of industrial heritage.

Like other heritage assets, the economic benefits associated with preserving and reusing industrial complexes arise from either use and non-use (passive use) values. Individuals may benefit from directly visiting industrial sites or using refunctionalized industrial buildings that maintain elements of the industrial past. At the same time, they can express a non-market demand based on the perception of an existence, option and bequest values for the industrial heritage.

Economic valuation of cultural goods has expanded as a field of inquiry in the last decades, with the Contingent Valuation Method (CVM) being the most widely adopted approach in heritage economics to assess the non-market demand for cultural heritage [26]. Yet, incredibly very little research has focused on industrial heritage sites. Damigos and Kaliampakos [27] applied Contingent Valuation to estimate residents' willingness to pay for alternative rehabilitation projects of an abandoned quarry site in Athens, Greece. Chao [28] estimated the non-use values for residents of Beijing Coking and Chemical Works site, obtaining an average WTP from respondents of 71 RMB (almost 10.3 USD).[3] Bingbing and Yingchun [29] assess through CVM the recreational value of Ansteel Exhibition Hall, one of the oldest steel factories in China, by investigating the individual preferences of Anshan city inhabitants. The estimated average WTP is 20 RMB (2.9 USD) and is positively related to the age and level of education of respondents.

While CVM has been often used for assessing the demand of cultural heritage sites, applying this method to industrial heritage might be more problematic. One acknowledged limitation of CVM is that it allows to measure individual WTP for only a single preservation or rehabilitation scenario, that is a good defined according to specific attributes, but with the level of attributes that change simultaneously only in respect to the status quo condition [30]. Conversely, preferences for the rehabilitation and adaptive reuse projects of industrial buildings might be relatively more heterogeneous with respect to the level of preservation of specific

[3] The exchange rate used is the average rate for 2020 the year in which the data were collected, 6.9022 RMB/US$ (https://www.exchangerates.org.uk/USD-CNY-spot-exchange-rates-history-2020.html).

Fig. 2. Examples of structures of Baosteel Stainless Steel Co., Ltd.

attributes of the industrial heritage. As a result, discrete choice experiments might represent a more suitable economic valuation technique to investigate industrial heritage.

In the field of cultural heritage, choice experiments have been applied quite rarely, mainly to assess tourists' demand for heritage attractions as multi-attribute products. Notable examples of applications are from Italy [31], Greece [32], Portugal [33] and New Zealand [34].

4. Materials and methods

4.1. Discrete choice experiment

In this study, we apply a Discrete Choice Experiment to elicit individuals' willingness to pay for a hypothetical renewal project of the Baosteel industrial site concerning the transformation into the newly envisioned entertainment and artistic hub, but with different degrees of industrial attributes. In DCEs the respondents are asked to state their most preferred alternative within a choice set in each choice situation. A variety of econometric models can be employed to model discrete choices. We chose the Mixed Logit (MXL) model in preference space,[4] within the Random Utility Theory [35], because it guarantees to relax the Independence of Irrelevant Alternative (IIA) assumption characterizing standard Conditional Logit models. Following Train and Weeks [36], the utility function is assumed to be separable in the price attribute p and non-price attributes x. Thus, the utility of each decision-maker n for the alternative j in choice situation t is written as:

$$U_{njt} = \alpha p_{njt} + \beta_j x_{njt} + \varepsilon_{njt} \quad (1)$$

where p is the cost attribute and x the vector of non-price attributes and ε_{njt} an independent and identically distributed (i.i.d.) first type extreme value error term. In CE, it is possible to use an Alternative Specific Constant (ASC) to identify individual preferences for the Status Quo against all other possible intervention alternatives. In unlabeled CE, it is a common practice to exclude the ASC [37] to better identify the pattern of preferences among attributes rather than those for generic interventions. In our case, the inclusion of the ASC would allow us to capture a preference for generic interventions for industrial heritage preservation, whereas the primary focus of our choice experiment is to better understand what values and attributes of industrial heritage individuals consider priorities for preservation. As a result, we used the ASC, coded 0 for the Status Quo and 1 for the intervention alternatives, only interacted with the individual-specific variables to ensure the identifiability of parameters. In fact, in the RUM framework, the absolute level of utility is irrelevant, and the choice probability depends only on the difference in utility, thus, the only parameters that can be estimated are those that capture differences across alternatives. This is the reason why the individual characteristics - invariant with respect to alternatives - must be introduced in the model as interaction with the ASC.

In the MXL models, the parameters α and β_j can be random and individually specific (i.e., α_n and β_{nj}), and we can rewrite equation [1] as follows:

$$U_{njt} = -\lambda_n^* p_{njt} + w_n' x_{njt} + r_n' \ ASC * z_n \ + \eta_{njt} \quad (2)$$

[4] In the MXL in preference space the researcher specifies the distribution of coefficients in the utility function and derives the distribution of *WTP*. On the contrary, in the case of the MXL in WTP-space the distribution of *WTP* is directly specified. Train and Weeks [36] proved that the two models are theoretically equivalent but the models in WTP-space overcome the issue of undefined standard errors of the ratio of estimated coefficients. Nevertheless, Carson and Czajkowski [68] pointed out that MXL in preference space is appropriate if one is interested in retrieving the associated preference space parameters, i.e. to compute elasticities or market shares. The choice between the two models is heavily case-dependent: in our application, following Frontuto et al. [69], we used MXL in preference space because it guarantees more reliable WTP estimates and it greatly reduces the computational burden associated with its estimation.

Table 1
DCEs attributes and levels.

criterion	Attributes	Level 1 (status quo)	Level 2	Level 3
Material	Landmarks protection (exterior)	All demolished All the industrial heritage is demolished and replaced by new buildings.	Preserve some landmarks Only iconic landmarks can be preserved	Preserve landmarks and ordinary factory building Some landmarks can be preserved plus ordinary factory buildings.
	Interior atmosphere	All demolished The interior of the plant is cleared, and replaced by new frames.	Preserve interior frames Part of the interior frame is preserved	Preserve frames and machines Both the interior and the machines are partially preserved
Non-material	Heritage Interpretation facilities	Information Center History archives, documentaries, historical-fiction films, television of Baosteel group	Information and Experiential Center An Information center plus a virtual Steel production experience	Information and Experiential Center and walk tours As level 2 plus a guided walking tours around the complex
Payment	Entry Fee	0 – 15 – 30- 60 – 80 (RMB)		

where $\lambda_n^* = \alpha_n/\mu_n$ is the preference-space coefficient for the cost of the alternative (α_n is the marginal utility of income, μ_n is the logit scale parameter); z_n is the vector of the individual characteristics interacted with the ASC; w_n and r_n are the vectors of the ratios β_{nj}/μ_n and $\eta_{njt}= \varepsilon_{njt}/\mu_n$ is the *i.i.d.* random term. Under the assumption that the error component is *i.i.d.* extreme value distributed the probability that an individual n will choose the alternative i in each choice situation t, conditional on β_n, is the following logit formula:

$$P_{nit}\left(\beta_n\right) = \frac{e^{-\lambda_n^* p_{nit} + w_n' x_{nit} + r_n' \ ASC \ z_n}}{\sum_{j=1}^{J} e^{-\lambda_n^* p_{njt} + w_n' x_{njt} + r_n' \ ASC \ z_n}} \quad (3)$$

Assuming a continuous cumulative density function of parameters ($F(\beta|\theta)$), the unconditional choice probability for each sequence of choices is:

$$P_{nit} = \int P_{nit}\left(\beta\right) f\left(\theta\right) d\beta \quad (4)$$

where f is the density associated with F and θ is a vector of parameters. The coefficients in the preference space can be estimated by using maximum simulated likelihood [38].

Using the indirect utility function of eqn. [1], the marginal rate of substitution between the DCEs attributes and income is a proxy of the marginal WTP of the attribute and it is simply the ratio of the estimated coefficient of each attribute and the estimated coefficient of the monetary attribute [39].

4.2. Attributes and levels of the DCE

We design the hypothetical scenario of renovation of the site by using attributes related to material and non-material (intangible) aspects of industrial heritage, and an entry fee to access the art and entertainment hub as a payment vehicle (Table 1). Gil, et al. [40] point out that one of the peculiar characteristics of industrial heritage is the variety of scales in which these assets can appear. For the material aspects of the industrial heritage, we choose two attributes: landmarks conservation and interior atmosphere. The first attribute includes exterior physical components such as chimneys, warehouses, furnaces, and other similar elements that contribute to the perception of the historic and architectural quality of the industrial landscape. The interior atmosphere attribute refers to the renovation of interiors while conserving iconic equipment or frames that can witness industrial heritage's technological value and uniqueness.

Three levels were identified for these attributes depending on the amount of preserved structures and machinery. The first level represents the *status quo*: all the industrial heritage is demolished and replaced by new buildings, or the plant interior is cleared and replaced by new frames. The second level indicates an intervention to preserve only some elements of the industrial heritage, with a view to adaptive reuse. For the exterior, respondents were proposed the preservation of the most iconic landmarks, while for the interior, a re-functionalization of the spaces while maintaining some of the industrial frames. The third level represents the solution of greater preservation of the industrial heritage, proposing the preservation of even the most ordinary industrial structures and the display of iconic machinery and equipment in the interior to convey the industrial past of the place in a more immersive way.

To convey the intangible heritage component, interpretation facilities related to the Boasteel complex and the industrial steelmaking process have been chosen as the main attribute. Heritage interpretation loosely refers to any communication process designed to reveal meanings and relationships of cultural and natural heritage to the public [41] and is usually performed in dedicated centers. For this attribute, we identify three levels indicating a growing supply of opportunities to access information or experience the intangible heritage of industrial culture, with the underlying hypothesis that different types of visitors would demand different experiences of industrial heritage culture. In the first level (information center), visitors might access historical archives and multimedia materials, gaining a broad understanding of the company's history. The second level includes all the features of the Information Center. Additionally, it offers visitors a virtual steel production experience. Participants can engage with interactive displays and simulations to gain firsthand insight into the steelmaking process. The third level combines the experiences of the previous ones with guided tours of the Baosteel complex. These tours provide visitors with a close-up view of the industrial infrastructure and heritage sites, creating a truly immersive and tangible exploration of Baosteel's industrial complex.

The chosen payment vehicle is an entry fee, which is a scheme widely adopted for assessing amenities and recreational opportunities linked to the preservation of cultural and natural heritage [26,42], also in the Chinese context [43]. While additional fees can be charged for individual attractions and services inside the new arts and entertainment hub, respondents were informed that the entry fee was proposed for the maintenance of the structure, including the preservation of the industrial heritage attributes. Moreover, to ease the comparative evaluation of respondents' choices and elicit fees that can be realistically leveraged in the proposed scenarios, the bid vector has been selected in line with the entrance fees of other cultural attractions in Shanghai.[5] As a result,

[5] We collected entrance fees for: Shanghai Handicraft Exhibition Hall, Sluice Site Museum in Yuan Dynasty (0 RMB), Shanghai Fengdian Ke Pu Guan, Nanxiang His-

the levels for the entry fee have been set at RMB 0, 15, 30, 60, 80 (USD 0, 2.23, 4.46, 8.92, 11.89).

The choice sets present two alternative policy interventions and a third alternative representing the *status quo*. The attributes and their different levels generate 135 profiles. In order to reduce the number of alternatives and choice sets, we use a fractional factorial design [44]. Willis [42] showed that the fractional factorial experimental design can estimate main effects and second-order effects with fewer runs than full factorials, although higher-order effects can still be confused or aliased (i.e. they cannot be distinguished). Our final design resulted in 30 choice sets divided into 6 blocks (see Fig. 3). Every respondent was presented with one block randomly assigned, with 5 questions each, to reduce any potential fatigue effect.

4.3. Experimental design and survey

In this study, the potential visitors of the new artistic and entertainment hub located in the Baosteel factory have been chosen as the target group of the discrete choice experiment. This choice was dictated by the need to identify a payment mechanism realistically applicable in the local context (entrance fee) that could be associated with the renovation scenario of the industrial site. As a result, this approach is likely to capture mainly the use values associated with preferences for the preservation of industrial heritage attributes of the site. At the same time, a positive WTP for the proposed entry fee by potential visitors may also indicate the willingness to contribute to the preservation of the industrial heritage attributes of the site due to some passive use values (i.e. bequest, altruistic value).

One of the challenges of this research, and in general of stated preferences methods, is to be consistent with the assumption of well-informed individuals who should state their preferences for a good they are familiar with. To detect the respondents' knowledge of industrial heritage, the first part of the questionnaire presented questions about attitudes and experiences of industrial heritage sites. The second part introduces the history and current situation of Baosteel by showing a video to respondents to make them more familiar with the case study and reduce any potential information gap. Then, respondents were presented the choice sets to evaluate different conservation policies with pictures and a detailed explanation of the attributes and their levels. Finally, the third part aimed to gather the respondent's socioeconomic characteristics, including gender, age, educational background, income and place of residence.

The main factors to consider when choosing survey mode are cost, time, and the amount of assistance available [45]. Traditionally, face-to-face interview has been the recommended "gold standard" for stated preferences [46–48]. However, due to their cost-effectiveness and large numbers of respondents, web-based surveys have gained widespread use in recent years [49–54]. While internet surveys are generally much cheaper than other survey modes, the generalizability of obtained results is likely dependent on the level of internet penetration in a given country or region [49]. Moreover, online surveys can be subject to selection bias because elderly or low-income people are less likely to participate in the survey because they do not have access to the internet or are simply not familiar with the use of technological devices. As a result, we combine web-based and face-to-face collection of interviews to mitigate any selection bias due to the collection of interviews by using only online platforms. For the web-based survey, participants were recruited from several online social networks (WeChat and QQ, two of the most popular messaging services in China). The face-to-face survey has been mainly carried out in Baoshan District (where the study site is located), in Yangpu District (an area with several industrial brownfields) and in Huangpu and Jing'an District (Central area of the city).

The surveys were administered from August to September 2020. Table 2 shows the main demographic variables for the samples. A total of 875 interviews were obtained,[6] 678 for the web-based survey (almost 77.5 % of the total) and 197 for the face-to-face interviews (the remaining 22.5 %). The individuals interviewed were mainly composed of residents in Shanghai (77.49 %) with a medium level of income and a high level of education: about 75 % of the sample was college-educated, with a bachelor's degree (461, 62.40 %) or graduate degree (132, 15.09 %). As expected, our sample is slightly younger than the Shanghai population (34.25 vs 37.7 average age) and more educated (62 % attend the college versus 33.85 %) [55]. However, the strategy of combining data collection through web surveys and on the field appears to have mitigated the differences with respect to the population of Shanghai and have ensured a more adequate sample representativeness. At the same time, the relatively higher proportion of educated respondents can be partially accounted for by the target profile of respondents, which by design was conditioned on the self-reported interest in visiting the cultural amenity under study.

4.4. Linking individual economic values and cultural attitudes towards industrial heritage preservation

A methodological aspect of further interest in the analysis is the relationship between respondents' economic preferences and their attitudes toward the cultural value conveyed by industrial heritage. In the first part of the questionnaire, respondents were asked to state their agreement or disagreement - using a Likert 1 to 5 scale - with respect to a series of statements that capture different dimensions of attitude toward industrial heritage, namely demolition due to absence of any value (Q1), recognition of the value in the tangible aspects and preservation through adaptive reuse (Q2), relevance for the transmission of the intangible heritage conveyed by industrial sites (Q3) and tourism potential of industrial heritage for local development (Q4).

Respondents were then grouped on the basis of a cluster analysis using their similarity in the relative importance given to the different dimensions.[7]

We applied a hierarchical aggregation procedure using the Euclidean distance measure and the Ward's linkage method to maximize the internal homogeneity of clusters [56]. The Euclidean distance is a measure of similarity between two data points in a multidimensional space and it measures the straight-line distance between those points. The Ward's linkage is a method for combining clusters and it aims to minimize the increase in the total within-cluster variance when merging clusters. The basic idea is to merge the two clusters whose combination results in the smallest increase in overall variance. Hierarchical clustering does not require to specify the number of clusters in advance, as in some

tory and Culture Exhibition Hall Shanghai Wood Culture Museum, Shanghai Zunmu Art Museum (1-30 RMB), Shanghai Automobile Museum, Shanghai Film Museum, Liuli China Museum, Shanghai Science and Technology Museum, Jiangnan Sanmin Cultural Village, Guangfulin Cultural Heritage Park, Shanghai Aviation Science Museum, China Maritime Museum (30-60 RMB), China Industrial Design Museum, Shanghai Film Shooting Base, Guanfu Museum (60-100 RMB).

[6] To be consistent with the choice experiment design targeting potential users of the site, we excluded from the survey 89 respondents who declared they were not interested in visiting the new Baosteel art center. The main motivation are not being interested in the site (43%) or not being interested in industrial landscape (39%).

[7] Because statements in Q1 and Q2 tend to express opposing attitudes by construction and the answers are potentially negatively correlated, we choose to use only one of the two dimensions, namely Q2.

Fig. 3. Example of choice set.

other clustering methods (i.e. k-means) but clusters are identified by cutting the resulting dendrogram at the desired level. In order to minimize the arbitrariness of this process, we followed Charrad et al. [57] and used a set of 30 numerical and graphical indices to identify the optimal number of clusters. The identified clusters are then used for a split-sample analysis to investigate and test differences among users in their WTP for different levels of attributes of the industrial heritage.

5. Results

5.1. Preferences for industrial heritage

We estimated several models, to measure respondents' WTP, and ran tests to choose the most appropriate specification. We present the results of the Mixed Logit model in preference space, that allows us to relax the IIA, and a standard MNL as a benchmark (Table 4). In the MXL model we assumed as random the just the entry fee coefficient: we tested different distributions and we present the model with the better fit that assumes a standard normal distribution. We tried different model specifications including random coefficients for all the attributes or just some of them, but none of the standard deviations was found to be significant except for the one referring to the entry fee. We employed various socio-demographic characteristics, including age, gender, income, and education. To distinguish respondents with elevated income and education levels, we transformed these variables into binary ones. They were assigned a value of one if the individual's income exceeded the median income of the sample and if the respondent graduated.

Both the MNL and the MXL models are statistically significant at a high confidence, and all of the coefficients of the attribute

Table 2
Socio-demographic characteristics.

		Total		Web-based survey Sample		Face-to-face survey Sample	
		N	%	N	%	N	%
Age	< 18	25	2.86 %	19	2.80 %	6	3.05 %
	18–24	193	22.06 %	177	26.11 %	16	8.12 %
	25–34	305	34.86 %	269	39.68 %	36	18.27 %
	35–44	149	17.03 %	128	18.88 %	21	10.66 %
	45–54	113	12.91 %	59	8.70 %	54	27.46 %
	55–59	43	4.91 %	15	2.21 %	28	14.21 %
	60>	47	5.37 %	11	1.62 %	36	18.27 %
Gender	female	383	43.77 %	284	41.89 %	99	50.25 %
	male	492	56.23 %	394	58.11 %	98	49.75 %
Residence	Outside Shanghai	197	22.51 %	193	28.47 %	4	2.03 %
	In Shanghai	678	77.49 %	485	71.53 %	193	97.97 %
Education	Middle school	33	3.77 %	0	0 %	33	16.75 %
	High school	164	18.74 %	140	20.65 %	24	12.18 %
	Vocational and college	546	62.40 %	450	66.37 %	96	48.73 %
	Graduate school	132	15.09 %	88	12.98 %	44	22.34 %
Monthly income (RMB)	≤3999	187	21.37 %	154	22.71 %	33	16.75 %
	4000–9999	400	45.71 %	315	46.46 %	85	43.15 %
	10,000–14,999	171	19.54 %	133	19.62 %	38	19.29 %
	≥ 15,000	117	13.37 %	76	11.21 %	41	20.81 %
Num. Observations		875		678		197	

variables, with the exception of the Machineries in the MXL model, were highly significant.[8]

The estimated coefficients for the attribute that identifies the protection of Landmarks is positive and statistically different from 0, meaning that the respondents are willing to pay a positive contribution for this level of protection compared to the *status quo*. The estimated coefficient of the attribute related to the conservation of Buildings is positive and statistically different from zero at the 5 % significance level. The comparison of the coefficients of Landmarks and Buildings highlights that respondents rank higher the conservation of Landmarks only rather than that of Landmarks and Buildings, suggesting scarce interest for preserving the ordinary factory buildings.

For the attribute related to the interior atmosphere, we notice that respondents prefer to sustain policies to preserve Frames rather than both Frames and Machineries. In fact, the coefficient related to the conservation of Frames is significant for the MNL as well for the MXL model, instead the coefficient for Machineries is lower than the one for Frames in the MNL and even not significant in the MXL.

For the intangible heritage of Baosteel we estimated the coefficients for the two levels of the attribute indicating different extents of the cultural experience, namely an Information Centers and both an Information and an Experience Center. The estimated coefficients for both the Information Center and the Experimental Center are positive and statistically significant, the former at the 10 % significance level, while the latter at 1 % level. The estimated parameters suggest that respondents are more willing to pay for a wider supply of cultural services suggesting a strong propensity to enhance the intangible component of the Baosteel cultural heritage. Moreover, these results may suggest that respondents are interested in contributing to the creation of cultural hubs that can attract tourism and visitors by boosting the local economy.

Lastly, the negative estimated coefficient for the entrance fee is in line with standard expectation with respect to the effect of prices on preferences. Moreover, we reject the null hypothesis for the standard deviation of the cost coefficient supporting the choice of assuming this parameter as random.

The results of the estimated coefficients reported in Table 3 are then employed to compute the empirical distribution of WTPs by using the Krinsky-Robb simulation method [58]. In Table 4, we show the WTPs for each attribute by using the MXL model presented in Table 3.

The WTPs presented in Table 4 mirror the estimated coefficients of Table 3, indicating a higher willingness to pay for Landmarks, Frame, and the combination of Information and Experiential Center. In particular, the WTP for preserving landmarks and all industrial architecture (landmarks plus buildings) is 6.03US$ (41.65 RMB) and 3.51US$ (24.25 RMB) respectively. As already commented before, this result means that respondents prefer to protect landmarks of industrial heritage instead of the whole set of industrial buildings.

The coefficient of the Machineries is not significant and therefore, even if measured in 2.20 US$ (15.19 RMB), the WTP presents high variability and thus poor significance.

The WTPs for the Information Center and the combination of the Information and Experiential Center are 3.06 US$ (21.18 RMB) and 5.10 US$ (35.25 RMB) respectively, showing a strong preference for the conservation and transmission of the intangible heritage.

In the end, according to the WTPs of Table 4, the efforts of conservation policies ought to focus on industrial landmarks and an heritage interpretation center with experiential function.

5.2. Attitudes for industrial heritage and economic preferences

In this section, we present results from the analysis of individual attitudes toward industrial heritage preservation and how they are associated with respondents' economic preferences. Using the responses to the four attitudinal questions in the survey it is possible to highlight how respondents' valuations display some diverging patterns between the two samples interviewed either face-to-face or online (Table 5). The sample from the web-based survey is in general slightly less interested in conservation of tangible heritage, with a relatively stronger agreement in demolishing industrial brownfields and lower agreement in promoting adaptive

[8] The models presented in Table 3 have no alternative-specific constants. As suggested in Hole [37] this is common practice when the alternatives to be chosen are unlabeled.

Table 3
Result of MNL and MXL models.

	Multinomial logit (ML)		Mixed-logit 1(MXL)	
	Estimates	St.Err.	Estimates	St.Err.
Some Landmarks	0.466***	0.055	0.271***	0.06
Landmarks and Buildings	0.329***	0.064	0.158**	0.067
Some Frames (Level 2)	0.351***	0.058	0.169***	0.062
Frames and Machineries (Level 3)	0.268***	0.062	0.099	0.065
Information and Experiential Center (Level 2)	0.309***	0.062	0.138**	0.065
Information and Experiential Center and walk tours (Level 3)	0.391***	0.064	0.229***	0.067
Entry Fee	−0.003***	0.001	−0.007***	0.0012
Monthly income			0.371***	0.109
Graduated (highly educated)			0.567***	0.109
Gender (Male=1, Female=0)			−0.004	0.104
Age			0.024	0.031
St.dev. Fee			0.008**	0.004
log-likelihood	−2756.3		−2711.5	

Note:
*** Significant at the 1 % level.
** Significant at the 5 % level. *Significant at the 10 % level.

Table 4
Mean marginal willingness to pay (WTP in RMB and US$ per person).

	WTP-Mixl	Lower bound	Upper bound
Some Landmarks (Level 2)	6.03US$ (41.65 RMB)	3.42US$ (23.66 RMB)	10.15US$ (70.07 RMB)
Landmarks and Buildings (Level 3)	3.51 US$ (24.25 RMB)	0.6 US$ (4.37 RMB)	6. 40 US$ (44.22 RMB)
Some Frames (Level 2)	3.75 US$ (25.91 RMB)	1.19 US$ (8.27 RMB)	6.83 US$ (47.16 RMB)
Frames and Machineries (Level 3)	2.20 US$ (15.19 RMB)	−0.94 US$ (−6.51 RMB)	5.05 US$ (34.92 RMB)
Information and Experiential Center (Level 2)	3.06 US$ (21.18 RMB)	0.63 US$ (4.37 RMB)	6.25 US$ (43.14 RMB)
Information and Experiential Center and walk tours (Level 3)	5.10 US$ (35.25 RMB)	2.31 US$ (15.98 RMB)	8.25 US$ (56.96 RMB)

Note: 1US$ = 6.73 RMB.

Table 5
Attitudes towards industrial heritage, mean values from 1 to 5pts likert scale.

	Total Sample	Web-based survey Sample	Face-to-face survey Sample
Q1: agree to demolish (1–5 scale)	2.55	2.69	2.06
Q2: agree to adaptive reuse (1–5 scale)	4.09	4.08	4.13
Q3: agree to intangible heritage preservation (1–5 scale)	2.77	2.92	2.25
Q4: agree on tourism potential (1–5 scale)	4.25	4.22	4.36

reuse. At the same time, the same group of respondents presents higher propensity towards conserving the intangible component of the industrial heritage with respect to the individuals interviewed face-to-face. This result could be partly explained by the age composition of online respondents, that is relatively younger than the sample collected through face-to-face interviews, pointing to possible generational differences in the way industrial heritage can be appreciated. Additionally, we notice a general agreement in the promotion of industrial heritage for tourism as a booster for local development.

Based on the clustering approach discussed in Section 4.4, we identified two main clusters as optimal grouping by applying the majority rule [57].

As illustrated in Table 6, group 1, which represents 46.9 % of the sample, is characterized by a clear support to the preservation through adaptive reuse of the physical and material component of industrial heritage. Respondents from this group tend to be against demolition and in favor of adaptive reuse strategies, while they tend to care less for the preservation of intangible components through archival sources or interpretation. Conversely, respondents in group 2 (53.1 % of the sample) have more balanced attitudes between demolition and adaptive reuse of industrial buildings. At the same time, relative to Group 1, they have a more pronounced propensity for the preservation of the intangible heritage represented by industrial sites.

In order to measure differences in preference structure between the two clusters, we estimated the model by applying a split sample procedure. This estimation strategy is the most flexible because it allows all parameters to be estimated freely between groups.[9] The estimated coefficients presented in Table 7 show differences in perceptions of conservation scenarios between the two groups.

The test over the difference of WTPs for the two groups is performed using the complete combinatorial convolution method [59], an empirical numeric procedure used to measure the differences between independent distributions. We compare 1000 random draws from the empirical distributions of the estimated WTP for each attribute for the 'Sensitive group' (Group 1) and the

[9] Appendix A, Table A1 reports the results of a model estimated on the entire sample but including a dummy variable identifying the group of respondents more sensitive to heritage conservation. The results confirm the validity of the split sample procedure, in fact the coefficient of the dummy variable identifying the sensitive group - interacted with the ASC - is different from zero and with a positive sign. The WTPs are in line with the ones of Table 4 and belonging to the sensitive group increases the WTP by 7.67 US$ (52.98 RMB).

Table 6
Respondents' clusters detected according to attitudes towards industrial heritage.

	Group 1	Group 2
Q1: agree to demolish (1–5 scale)	1.87	3.15
Q2: agree to adaptive reuse (1–5 scale)	4.33	3.89
Q3: agree to intangible heritage preservation (1–5 scale)	1.62	3.78
Q4: agree on tourism potential (1–5 scale)	4.40	4.12
Number of observations	*410*	*465*

Table 7
Estimated coefficients and WTPs for the two groups.

	Mixed Logit (Group 1)		Mixed Logit (Group 2)	
	Estimates	St.Err.	Estimates	St.Err.
Some Landmarks (Level 2)	0.358***	0.002	0.207**	0.082
Landmarks and Buildings (Level 3)	0.308***	0.099	0.025	0.095
Some Frames (Level 2)	0.301***	0.093	0.058	0.086
Frames and Machineries (Level 3)	0.144	0.097	0.086	0.089
Information and Experiential Center (Level 2)	0.107	0.096	0.202**	0.091
Information and Experiential Center and walk tours (Level 3)	0.247**	0.100	0.242***	0.092
Entry Fee	−0.006***	0.001	−0.006***	0.001
Monthly income	0.580***	0.179	0.189	0.145
Graduated (highly educated)	0.632***	0.183	0.558***	147
Gender (Male=1, Female=0)	0.052	0.161	−0.009	0.143
Age	−0.027	0.045	0.097**	0.045
St.dev. Fee	0.011**	0.005	0.011**	0.004
log-likelihood	−1237.7		−1463.3	
N. obs	410		465	

Note:
*** Significant at the 1 % level.
** Significant at the 5 % level. *Significant at the 10 % level.

Table 8
WTPs for the two groups.

	WTP - Group 1	WTP - Group 2	Convolution test (*P-values*)
Some Landmarks (Level 2)	7.97 US$ (55.01 RMB)***	4.53 US$ (31.26 RMB)***	0.131
Landmarks and Buildings (Level 3)	6.87 US$ (47.40 RMB)***	0.55 US$ (3.80 RMB)***	0.012**
Some Frames (Level 2)Frame	6.70 US$ (46.21 RMB)**	1.27 US$ (8.75 RMB)***	0.028**
Frames and Machineries (Level 3)	3.21 US$ (22.18 RMB)***	1.89 US$ (13.04 RMB)***	0.303
Information and Experiential CenterInformation Center (Level 2)	2.38 US$ (16.42 RMB)***	4.42 US$ (30.53 RMB)***	0.762
Information and Experiential Center and walk tours (Level 3)	5.49 US$ (37.94 RMB)***	5.30 US$ (36.54 RMB)***	0.467

Note: 1 US$ = 6.9022 RMB.
Significance Level of differences in WTP:.
*** 1 % level.
** 5 % level. *10 % level.

'Non-sensitive group' (Group 2). The number of times that, in the 1,000,000 combinatorial comparisons, the difference between the WTPs is different from zero defines the probability to accept the null hypothesis. In Table 8 the WTPs and the convolution test results are reported. The attributes related to Building and Frame are the only ones that are statistically different from zero meaning that the two groups have a different preference structure for these two attributes.

6. Discussion

The empirical analysis points out several patterns concerning individual preferences for industrial heritage that are worth discussion. The results confirm that for reuse projects concerning industrial buildings, respondents prefer preserving attributes of the industrial heritage, rather than pure demolition or substitution choices. Concerning interior and exterior tangible aspects of industrial buildings, prospective users of the space tend to support selective rather than extensive preservation in both cases. Individuals have more pronounced preferences for preserving only the most visible and iconic components of the interior and exterior of the complex, rather than its complete integrity. These initial findings, obtained not through experts' opinions, underline how eliciting preferences of local residents or prospective users through choice experiments can be a viable approach to design adaptive reuse strategies for industrial heritage projects (Oppio et al., 2017). In fact, individuals tend to recognize the trade-off between maintaining the atmosphere of the industrial past with the need to convert spaces to accommodate new functional uses [60].

At the same time, our analysis indicates that the propensity for preservation of prospective visitors of ex-industrial sites is greater for external elements, such as landmarks and buildings, than for internal ones, such as frames and machineries. One possible explanation for this pattern can be traced to information or hypothetical bias (inter alia [61]), whereby individuals are more likely to appreciate the exterior attribute presented in the scenario than to imagine the transformation of the interior. Moreover, concerning interpretation facilities, individuals tend to prefer a more immersive experience over accessing only informational material. This finding can be read as clear indication for devising specific interpretation strategies in line with the growing literature on industrial heritage tourism [10]. Industrial heritage, as a tourism product, encompasses not only the physical dimension of industrial structures and artifacts that can transmit authenticity values [62], but also the experiential dimension of past industrial and labour practices as well as of local communities connected to this type of heritage. The transmission of this latter dimension seems particularly relevant in the Asian context, as underlined by the *Taipei Declaration for Asian Industrial Heritage*, launched in 2012 [63], stressing the contribution industrial heritage makes to local identity in Asia as an expression of the close involvement of local people. In this perspective, the role of new technologies can be critical to provide visitors a more immersive and engaging experience concerning past industrial practices or convey the stories of local communities connected to the industrial past.

Sociodemographic characteristics also clearly influenced the respondents' preferences, providing some additional insights. In the MXL model presented in Table 3, income and education have a positive and statistically significant effect on the preferences for projects protecting the Baosteel industrial heritage. This finding, consistent with cultural economic literature [64], confirms that these factors are positively associated with the ability to pay for and preferences to consume cultural and heritage goods. At the same time, age and gender do not seem to determine a statistically significant shift in the probability of supporting an intervention on Baosteel. While this result can be potentially affected by sampling characteristics or context-specific conditions, it hints the possibility that demographic characteristics are less relevant in shaping preferences for industrial heritage.

Conversely, this study finds that the heterogeneity in cultural attitudes and values towards industrial heritage leads to marked differences in respondents' economic preferences. While attitudinal characteristics of respondents have been usually included in economic valuation studies, only in the last years there has been a more systematic and empirical assessment of the role of respondent's attitudes toward the cultural values in shaping individual preferences for cultural heritage conservation and enhancement [20,21]. For example, Choi and Fielding [65], in a contingent valuation study in Korea, find that WTP for heritage protection is correlated with respondents' cultural values expressed through an attitudinal scale. In a study on conservation and rehabilitation in Port Louis (Mauritius) Bertacchini and Sultan [66] find that the relationship between cultural values and economic preferences for heritage varies between residents and tourists, with individual WTP not always statistically explained by the different cultural value attributes perceived by respondents. Further, by using cultural attitudes to cluster respondents, Xiao et al. [67] find that different groups had divergent preferences toward the conservation of Chinese intangible heritage.

Similarly, based on questions eliciting attitudes toward conservation and development of industrial heritage's attributes, our analysis identifies two main groups of respondents who express quite divergent preferences based on their attitudes.

The first group of respondents (46 % of the total sample) is composed of those who express more pronounced attitudes toward the physical protection of industrial heritage and a positive willingness to pay for a wide range of physical attributes, concerning both exterior and interior aspects of the industrial site. On the contrary, individuals in the second group (54 % of the total sample) are relatively more willing to pay only for landmarks and the attributes concerning the interpretation of industrial heritage.

The economic preferences portrayed in the empirical analysis are in line with the attitudes identified in the two groups through the cluster method: the first group is in support of physical maintenance and adaptive reuse of the industrial site, while the second group value less the preservation of the industrial landscape, but more the transmission and interpretation of its intangible components. Interestingly, the econometric analysis also indicates that adding respondent's cultural attitudes besides socio-demographic characteristics does not alter the choice experiment's main findings, suggesting, from a methodological viewpoint, how both elements can be simultaneously relevant for shaping economic preferences for heritage conservation and development. As conservation of different attributes might imply trade-offs, these results indicate that understanding how respondents differ across attitudinal profiles and their relationship to preferences expressed for distinct heritage attributes may be useful to inform heritage conservation decisions as to effect on different groups of potential beneficiaries.

Finally, the results of the choice experiment on the Baosteel industrial factory offer some implications for the management and promotion of industrial heritage sites, particularly those whose use is adapted into a cultural attractor. Selective preservation of external structural components, focusing on the main landmarks of the industrial site is confirmed as the most effective strategy for meeting the preferences of potential users of the converted spaces. At the same time, site managers must invest in interpretation facilities to meet the knowledge and learning needs that potential visitors have about the intangible heritage of the industrial site. Regarding visitor outreach activities, there do not seem to be any particular differences among sociodemographic characteristics that would justify profiling activities to promote industrial heritage. Similarly, although there are visitor profiles with divergent attitudes toward industrial heritage, protection of landmarks and investment in interpretation facilities is an appropriate strategy to meet the preferences of both profiles.

7. Conclusions

The article has explored the economic valuation of industrial heritage, adopting a Discrete Choice Experiment method to estimate individual preferences for the preservation and reuse of distinct attributes of the Baosteel steel factory, an industrial brownfield in Shanghai planned to be transformed into an arts and entertainment hub.

The paper contributes to both the industrial heritage valuation and policy literature on several grounds. First, the study might better inform decisions concerning the conversion of industrial areas or industrial brownfield redevelopment. Experts have often endorsed the option of rehabilitation and refunctionalization of the unused structures to preserve the values and atmosphere of the industrial past partly. Our findings reveal that potential visitors of refunctionalized sites express preferences that align with this view. In particular, individuals tend to support selective rather than extensive preservation of physical attributes of the industrial sites, such as landmark buildings or interior frames. At the same time, at least in the Chinese context, there exists a demand for preserving and transmitting the intangible heritage of industrial culture along with adaptive reuse of the industrial sites.

Second, to our knowledge, the paper represents one of the first attempts to explore the economic valuation of industrial heritage through the Discrete Choice Experiment method. This method confirms to be particularly suited to address preferences for rehabilitation and adaptive reuse projects that can present a great degree of heterogeneity with respect to the level of preservation of specific attributes, like in the case of industrial heritage sites. Moreover, we added evidence on the relationship between respondents' economic preferences and their attitudes toward the conservation and development of industrial heritage by showing how distinct groups of respondents based on distinct attitudes partly express diverging preferences for single attributes of the industrial heritage.

Despite these contributions, a number of limitations should be noted. Firstly, choice modeling experiments are generally effective for informing decisions about cultural heritage preservation and reuse interventions in contexts where it is possible to clearly delineate renovation costs and identify the population of beneficiaries. Through estimating WTPs for preferences expressed for individual attributes, it is indeed possible to evaluate the effects of different interventions. In our case, due to an insufficiently defined renovation plan it was not possible to acquire data for cost estimation. Similarly, the lack of sufficient information on the future activities hosted by the art and entertainment hub made it difficult to do realistic projections on the number of potential beneficiary visitors. Secondly, it is worth noting that the economic assessment of individual preferences associated with the preservation and reuse of industrial heritage attributes captures only a few dimensions that are useful to the broader decision-making process inherent in the conversion of industrial brownfields. Indeed, decisions about the preservation and reuse of industrial heritage must necessarily also consider physical and social aspects that the transformation of industrial sites has in relation to the surrounding landscape and community. In this perspective, choice experiments can be a useful tool within more comprehensive multi-criteria analyses.

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Appendix A

Table A1
Estimated coefficients and WTPs of the MXL models with cluster dummy.

	Mixed Logit (MXL)		WTPs		
	Estimates	St.Err.	Average WTP	Lower Bound	Upper Bound
Some Landmarks (Level 2)	0.271***	0.06	6.19 US$ (42.72 RMB)	3.46 US$ (23.90 RMB)	10.78 US$ (74.40 RMB)
Landmarks and Buildings (Level 3)	0.150***	0.067	3.41 US$ (23.57 RMB)	0.54 US$ (3.75 RMB)	6.95 US$ (48.00 RMB)
Some Frames (Level 2)	0.160**	0.062	3.65 US$ (25.22 RMB)	0.93 US$(6.47 RMB)	6.90 US$ (47.62 RMB)
Frames and Machineries (Level 3)	0.093	0.065	2.12 US$ (14.61 RMB)	−1.22 US$ (−8.43 RMB)	5.06 US$ (34.95 RMB)
Information and Experiential CenterInformation Center (Level 2)	0.142**	0.065	3.26 US$ (22.50 RMB)	0.45 US$ (3.16 RMB)	6.78 US$ (46.85 RMB)
Information and Experiential Center and walk tours (Level 3)	0.224***	0.067	5.12 US$ (35.37 RMB)	2.44 US$ (16.82 RMB)	8.20 US$ (56.64 RMB)
Entry Fee	−0.006***	0.001			
Monthly income	0.438***	0.111	10.02 US$ (69.17 RMB)	4.88 US$ (33.68 RMB)	18.29 US$ (126.22 RMB)
Graduated (highly educated)	0.527***	0.112	12.05 US$ (83.20 RMB)	6.75 US$ (46.64 RMB)	21.59 US$ (149.01 RMB)
Gender (Male=1, Female=0)	−0.094	0.105	−2.16 US$ (−14.92 RMB)	−7.65 US$ (−52.83 RMB)	2.68 US$ (18.51 RMB)
Age	0.008	0.032	0.20 US$ (1.40 RMB)	−1.50 US$ (−10.39 RMB)	1.74 US$ (12.05 RMB)
Cluster Sensitive	0.336***	0.111	7.67 US$ (52.98 RMB)	2.2 US$ (15.61 RMB)	14.71 US$ (101.55 RMB)
St.dev. Fee	0.009**	0.004			
log-likelihood	−2706.4				
Chi-squared	9.9				

Note:
*** Significant at the 1 % level.
** Significant at the 5 % level. *Significant at the 10 % level.

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