

Valuing Sculpture: an investor's perspective

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Abstract

Hedonic pricing of artworks has previously relied mostly on auction sales databases; and the data obtained usually lacks any relevant aesthetic features of artworks. This paper focuses on sculpture as an overlooked segment of the art market and analyses the impact of aesthetic characteristics on sculpture prices realized at art auctions. First, using the traditional OLS hedonic pricing method we, first, regress prices of 63 375 sculptures on data obtained through auction price databases. Among statistically significant determinants of sculpture prices, here, the artist's reputation is found to be of large impact. Second, a single artist, César Baldaccini, is chosen so we can, with closer inspection of sculpture images, include more aesthetic features such as shape, color and style of work. Third, Interviews with art investors and non-investors are conducted and lead to extraction of richer aesthetic characteristics of César's sculptures. These are finally grouped into eight different categories, such as, imaginative, emotive, lyrical and so on, in accordance with prior art aesthetics literature. These findings indicate that art experts, whether consciously or not, are applying considerations beyond those that exclusively belong to Artworld, non-aesthetic, categorizations. Experts might focus on an artist's reputation or previous price history and can describe this as the basis of their price estimates. However, their estimates also include uncaptured aesthetic variables that are possible to isolate.

Introduction: justification for the research

The international art market, in 2010, had reached a value of 43 billion US dollars (TEFAF, 2011). Paintings and drawings made up the largest portion by turnover – about 86% of worldwide art auctions (Artprice.com, 2011). The next largest form of art bought and sold on the market – sculpture, generated about 10% of global auction turnover in 2010 (ArtPrice.com, 2011) a total value still over 4 billion US dollars. The basis for these trades, the rationale for the prices artworks achieve, have not been examined in any way that allows for investors to independently assess value. Despite the dollar volume of the trades, there is still no consensus about the profitability of investments in the fine arts (i.e. paintings, much less sculpture) although various researchers have attempted to establish the level of returns from such investments. While returns can be investigated in the fine arts and we can state categorically that these returns have been equal to a given amount over a specific time, it is less obvious what factors contribute to these returns.

Financial economists have determined that expected returns in the share markets have a great deal to do with the risks associated with corporate operational decisions. That the intrinsic value of the company is calculated based on expected future income streams modified by the level of risks associated with the expectations of achieving those cash flows. When the correct decisions are made, companies achieve profits that are distributed to shareholders in the form of either dividends or capital gains. The factors contributing to value in the art market, however, are not as well understood. From an economic perspective, the supply and demand for artworks from any particular artist, during their lifetime, should affect the price, with demand creating both greater outputs and higher prices. Also, from an economic perspective, once an artist whose works have been in demand dies, the price ought to rise, given the fact that no new works will be produced. So demand and scarcity are two factors that we believe ought to affect the price of artworks.

The creation of demand, in the Artworld, is based on an artist's reputation, built up over time as his or her works are shown, discussed and accepted by critics, by other artists and by investors. Access to this information about the artist's reputation and the value of individual artworks – given that not every piece is equally valuable – is not broadly and publicly available. The market for fine art is not as liquid as the market for stocks or bonds. One reason is that each artwork is ostensibly unique, although several copies of individual pieces may be created and signed by the artist; the supply of these identical works is limited. Thus there are not a large number of trades in identical assets being undertaken that lead to an established market price for those assets. It is, instead, a small, specialist market where mistakes could be costly. As not all investors are equally proficient in determining value in this area, mutual equity funds with this expertise have emerged to facilitate the buying and selling of fine arts (Gutner and Capell, 2005; McAndrew, 2010).

Art market specialists are generally associated with auction houses and they base their evaluations of the economic value or price of the artwork on previous sales data and on gross physical characteristics, such as size and medium (material). While these known characteristics associated with artworks have provided some insights into the valuation of them, they bear no relationship to the value considerations of art critics, art historians and other aestheticians. That is, the creation of a reputation that leads to economic value for an artwork is dependent on alternative considerations. Separating good from bad art; art that has value from art that has no value in any sense of the word but particularly in the economic sense relevant to an investor in artworks, requires an input from the experts.

There is, allegedly, a difference between artistic value and aesthetic value (Stecker, 2012). Drawing from current debates in aesthetics, with clear historical antecedents, we rely on two approaches to evaluating the arts. Aesthetic value is based on the artwork providing an

“aesthetically valuable experience” (Stecker, 2012) while artistic value is based on that which the “Artworld” connotes as valuable (Pratt, 2012). The aesthetic experience is the subject of John Dewey’s *Art as Experience* (1934), a seminal and still highly respected work in aesthetics. The Artworld, according to the institutional theory of art promulgated by George Dickie (1974) and developed on the ideas of Danto (1964), is that made up of critics, artists who are accepted in their discipline, investors and the like who have a common understanding of the discipline in which the artist operates, its historical traditions and mediums. We are not aestheticians and do not intend to contribute to this debate. We are, instead, using the elements of artistic and aesthetic values described in these theories to understand what factors may exist that can be isolated and quantified in order to determine an economic value for an artwork. While the artworld and aesthetic values are not the same as economic value, they provide, at minimum a contribution to the determination of an artwork’s price.

Throughout this paper, we have presented our approach to developing a price index for artworks and, in particular, for sculptures. A discussion of the valuation/pricing of sculpture, from an economic perspective, particularly if we are successful in assessing value determinants, can contribute to the artworld/aesthetic value debate. In the next section, we explain the development of our hypotheses. Thereafter, in section III, we explain our approach to data collection. This is presented in two parts, first in relation to the collection of data associated with Artworld characteristics and then the collection of data associated with Aesthetic characteristics. In Section IV our analytical method is given prior to a summary of the analyses of the two sets of characteristics. Finally, in Section V, we present our conclusions and suggestions for going forward

Historical Precedent and Hypotheses

Researchers who have investigated pricing in the art market have generally applied hedonic regression techniques based on the physical characteristics of the artwork (see for instance Buelens and Ginsburgh, 1993; Chanel, Gérard-Varet and Ginsburgh, 1996; de la Barre, Docclo and Ginsburgh, 1994; Czujack, 1997; Hodgson and Vorkink, 2004). They have usually relied on secondary market data from auction markets even though this makes up only a portion of the entire market. The secondary market is transparent and responds to supply and demand directly with immediate clearance of goods provided reserve prices are met. The primary market, comprised of galleries and art dealerships, is far less transparent (Velthuis, 2003). The information used by specialists in these markets to determine value tends to accord with the characteristics associated with Artworld requirements. For example, works of more reputed artists sell at a premium (Higgs and Worthington, 2005). This is in accord with the recognition bestowed upon particular artists by the Artworld. Characteristics of the art work related to the medium used and the size of the piece also affect the sales price (Czujack, 1997; Locatelli-Biey and Zanola, 2002). Again, this is in line with Artworld perspectives. Quoting Pratt (2012, pp.357) “Artistic value derives from what artists successfully intend to do in their works as mediated by functions of the art forms [materials] and genres to which the works belong” (Pratt, 2012, pp.357). Other information available from auction houses includes the name of the artist, the artist’s nationality, title of the artwork, technique, size, whether the work was signed, stamped, artist’s year of birth and death (if dead). This latter variable feeds into the scarcity consideration in an economic valuation based on supply and demand. However, the value of an artist’s demise has been examined and the “nostalgia” effect” is said to be short lasting (Matheson and Baade, 2004). Supply and demand is also affected by the uniqueness of a sculpture where those that have been cast in large numbers sell for less than those which have not (Locatelli-Biey and Zanola, 2002).

Additional information can be garnered on the auction house involved in the sale, the date of the sale, the foundry where the sculpture was cast (if cast), etcetera. None of these available characteristics refer to the subjective experience of the art work. All are potentially measures of Artworld or Economic considerations that may add artistic recognition/value to the sculpture. Price estimates and the actual hammer (sales) price, while available, generally are not included in regressions.

Determining aesthetic characteristics associated with value has not been done previously. While the idea is anathema to Artworld critics, there is precedent for applying the hedonic pricing technique using multiple regressions on a set of statistically significant characteristics inherent in any commodity. Sculpture is a commodity, bought and sold in public markets. The approach has been used previously in valuing unique commodities, e.g. housing (Correll, et al. 1977; McLeod, 1983; Li and Brown, 1980; and Abelson, 1979), air quality (Brookshire et al. 1982; Witte, et al., 1979; Harrison and Rubinfeld, 1978) and even opals (Cornelius, 1997). These studies show that inverse demand curves can be estimated from the information derived from hedonic regressions. This approach was followed by Cornelius (1997) when examining the valuation of opals where each gemstone differs and possesses numerous characteristics with varying patterns, colours, shapes, sizes, and even materials (matrices). That is, “the relative marginal contribution of a characteristic to the market price (McLeod, 1983) can be determined”. If it is possible to differentiate between and determine the marginal value of characteristics associated with individual unique stones, it should also be possible to apply the same approach to individual and unique sculptures. Whether this can be applied to aesthetic as well as artistic (artworld) characteristics is yet to be seen.

As a consequence of the forgoing discussion we have developed two hypotheses:

(H₁): Artworld and Economic characteristics associated with unique sculptures can be identified and their marginal contribution to the value of a sculpture determined.

(H₂): Aesthetic characteristics associated with unique sculptures can be identified and their marginal contribution to the value of a sculpture determined.

The approach we are taking could be said to go back to an early treatise on aesthetics (*the Critique of Judgement*) by Immanuel Kant (1790). While he was focused on how we can know anything at all, he made a distinction between form (percepts) and content (concepts) (Jones, 1969, p.19). That is, form could be recognized by the senses and would include variables such as size, colour, medium and other characteristics we have so far associated with Artworld variables. In his first treatise *the Critique of Pure Reason*, he explained that we understand the world through our senses and are restricted by them in our understanding (Jones, 1969). He then went on to the *Critique of Practical Reason*, (largely focused on the categorical imperative or justification for ethical behavior (a value concept)) (Jones, 1969). Values were associated with content or concepts, i.e. they were parts of our thoughts, determined by our reason not perceived directly by our senses. Both treatises were influential in his description of aesthetics as given in the third treatise, *the Critique of Judgment*. To understand how we determine aesthetic value, Kant suggests we have to first understand that our version of what is real is reliant on our senses, it's subjective. Secondly he believed that values were concepts that could be universalized. Therefore, aesthetics, to Kant partakes of both the internal, subjective experience and the universal. He wrote that if someone "proclaims something to be beautiful, then he requires the same liking from others; he then judges not just for himself but for everyone, and speaks of beauty as if it were a property of things" (Kant, 1790, p. 55). The idea that these concepts can be

universalized is a necessary pre-requisite to our collection of data on aesthetic variables, as will be seen in the next section.

Data Collection

Data that reflects either Artworld or economic characteristics associated with sculptures has been obtained from auction records providing information on the sale of well-known sculptors' work. That is, these individuals, by reputation alone, already fulfill Artworld criteria. However, apart from individual reputations, we hoped to discover other Artworld characteristics (medium for example) that would contribute to the marginal price of each piece. ArtNet AG, a company that provides services to fine arts professionals gave us access to over 800 international auction sales records going back to 1985. We have selected 181 international sculptors from 28 different countries for inclusion in the sample. These were selected based on the liquidity of their work, i.e. each had sales of over 100 sculptures during the 1985-2013 period. The total number of sales in the sample is 65 473 and they took place in 788 different auction houses in 43 different countries.

The information available on the sculptures included:

- name of the artist, the artist's nationality, date of birth, date of death
- title of the artwork, technique used, size,
- whether the work was signed or stamped

In addition, auction data was also provided in the data set. This included:

- the auction house involved in the sale, the date of the sale,
- the foundry where the sculpture was cast (if cast)

- price estimates and actual hammer (sales) price.

Not all of this data is reflective of Artworld values, as discussed previously. The name of the artist would carry information about that artist's reputation. Titles were deemed irrelevant although these conceivably reflect the artist's thoughts and may be a value characteristic. Auction data, particularly the information regarding the auction house, was also considered a reflection on Artworld values given that more prestigious auction houses probably carry more prestigious work. Whether the work was signed or was one of several editions and whether the artist was dead were all reflections of economic scarcity and were considered as such in our analysis. We could not anticipate whether other data, such as the foundry used or the season of the sale, nationality and age of the artist or other variables would be significant contributors to marginal price but included these variables in hedonic regressions anyway.

The more subjective, aesthetic value characteristics and their contribution to price had to be approached differently. To make this information more accessible we selected an individual artist, Cèsar Baldaccini (known as Cèsar), accepted by Artworld criteria as a fitting representative of modern sculpture. Born in 1921, César lived and worked through a chaotic and fruitful period in modern art. He was influenced by other French artists around him including Giacometti (whose studio was under César's living quarters). He was innovative in the materials he used, going through several relatively distinct periods where he created sculptured metal fantasies, 'compressions', 'expansions', human body part impressions and bas reliefs. He had 1232 sales of sculptures in the period between 1985 and 2012. As far as we are able to determine, none of those included in our pilot study used to access aesthetic variables were among those identified as fakes in the period following his death in 1998. By selecting a single accepted artist who was highly productive but less well known than Picasso, Rodin or Henry Moore, we controlled for the

influence of ‘name’ and, to some extent artistic style that could have affected respondents subjective responses to the sculptures. Using a random selection of 18 of César’s works we attempted to isolate terms that were used by respondents to describe these works. That is, this exploratory pilot study allowed us to isolate similar factors that could contribute to aesthetic value when so many disparate pieces were being examined. To do this, we asked people to simply describe the various sculptures in their own words while we took notes. The original dozen people asked to participate were from varying groups, i.e. males and females, young and old (teens to nonagenarians), those who liked and bought artworks to those who paid little attention to it, artists and non-artists. The most responsive of these groups were those who either considered themselves artistic or were practicing artists (graphic and fine arts, sculptors and ceramicists) and those who actively purchased art work, either as investments or for pleasure (or both). Given this not very scientific exploratory sample, it was decided that if we wanted to get further than “I like it” or “rubbish”, we should focus on the common terms used to describe the work by those who, at some point in their lives, actively purchased artwork.

We eventually interviewed twenty-nine respondents adding a number of art investors to our pilot study. A drawback to our approach is that we could not actually present these people with the sculptures we wanted them to assess. Instead we gave them colored pictures of the pieces describing the medium and emphasizing with our hands the size of each. We asked them to imagine walking around it while describing it to us and giving us their impression of each. We acknowledge the drawback of presenting people with only one angle on each work. The 18 pictures were randomly shuffled between each respondent so that we could avoid getting responses that showed increasing familiarity with César as we went through the sculptures.

We found that those sculptures that were disliked tended to get short negative descriptions while those that individuals were intrigued with would get long and complex descriptions. The descriptions of each piece were recorded separately but amalgamated for the purpose of reducing the number of terms to the minimum possible. A list of over 340 terms was reduced by a subjective process of grouping those that seemed similar (with reference to a thesaurus for support). We compared the terms used to those aesthetic qualities explained in detail in John Dewey's *Art as Experience* (1934). In the end, we had six terms that coincided with those that were emphasized by Dewey and that we felt that we could comfortably use to differentiate aesthetic characteristics between the various sculptures.

After determining the key aesthetic terms we would use to differentiate between art-works, we selected a new sample of César's work, this time controlling for size and medium as well. That is, we examined all (35) works in bronze between 31 and 41 inches tall. We also selected a separate set of all bronzes between 10 and 15 inches tall, a total of another 20 pieces. Together, we categorized each of these works as either containing or not containing particular aesthetic traits suggested by our exploratory study and reinforced by our reading of Dewey. Together, this gave us a total 55 separate pieces, enough to allow us to run a regression of price against the assigned aesthetic variables. Again, we avoided any focus or concentration on factors that described the physical characteristics of the artwork, as used by auction houses to record information about the sculpture.

Analysis

The impact of these characteristics on the price of sculptures has been estimated using the hedonic regression specified below - once in regard to Artworld and Economic variables, once in regard to aesthetic ones. The equation used was:

$$\ln p_{kt} = \alpha_0 + \sum_{i=1}^n \beta_i x_{ikt} + \sum_{t=0}^T \gamma_t t_t + \varepsilon_{kt}$$

Where, for the Artworld variables, p_{kt} is the natural logarithm of the price of a sculpture k sold at time t ; x_{ikt} is a set of sculpture price predictors (that is, characteristics of the sculpture); t_t is a dummy variable that is equal to 1 if the sale occurred in year t and zero otherwise; ε_{kt} is the random error term; α_0 , β_i , γ_t are the coefficients to be estimated. The regression takes a log form because art auction prices are strongly skewed due to the presence of a few very expensive art works (Higgs and Worthington, 2005; Agnello, 2002). In addition to the dependent variable one of the independent variables, namely *Sculpture Size*, is also log-transformed since it is a continuous variable. The rest of the independent variables are all dummy variables.

The percentage change in sculpture prices due to change in continuous variables is calculated by $(100 \times \beta_i \times \text{absolute change in the independent variable})$, whereas the percentage change in sculpture prices due to change in dummy variables is calculated by $(100 \times (e^{\beta_i} - 1))$ as explained in Halvorsen and Palmquist (1980). One of the dummy variables is excluded from the regression and is used as a reference to avoid perfect multicollinearity. Thus, coefficients of dummy variables in the regression represent an increase in the intercept relative to an increase in the intercept caused by the reference category.

The same equation was employed for the aesthetic variables. However, only size of the sculpture is included in the regressions as a control variable, apart from the aesthetic variables.

Again the hedonic method (equation given above) was employed using multiple regression analysis to isolate the set of statistically significant characteristics from among the aesthetic factors determined to be appropriate in our exploratory study and validated through our reading of Dewy. As indicated previously, the use of hedonic regressions for the development of price indexes is not new. Developed originally by Court (1939) and extended by Stone (1956), the method was becoming common by the time of Griliches (1971).

The equation developed by Griliches (1971) allowed for a number of traits possessed by an individual asset to be included in a mixed arrangement with dummy variables or a single best representative variable used to overcome multicollinearity between them. The equation “can be used to estimate change in price to changes in the subset of quantifiable variables” (Griliches, 1971, pp.59). Because the dependent variable is the log of price, the coefficients of variables which are included in logarithmic form which result from the regressions can be interpreted as price elasticities. That is, they “can be interpreted as the estimated change in price due to a unit change in a particular “quality” holding other qualities constant” (Griliches, 1971, pp.67).

Results

The final model developed to price artistic (Artworld) value included the following predictive variables (those directly related to the artworks characteristics enlarged): Place of Sale (5 alternatives), Medium (11 alternatives), Artist Name, Size (a continuous variable) and Year of Sale. Additional variables, classified as economic variables, included Sale Season (4 alternatives), Life Status, Presence of Signature. Over 60% of the sculptures were sold at Sotheby’s and Christie’s sales rooms, which is no surprise given that, these two auction houses are the two largest players in the art auction world. Two variables that might have been included

were left out. For *Production period*, the issue is not that serious – only 4,8% of the values were missing. However, for 67,7% of the sculptures there was no data about their *Uniqueness*. That is, we do not know whether those sculptures were unique or a multiple edition sculptures. It is noteworthy that, when the regression was run with the *Uniqueness* variable included, with listwise deletion of missing variables (only cases with known Uniqueness are included), the variable *is* significant (*sig.* value 0,000) with a coefficient equal to -0,85 meaning that sculptures that are produced in multiple editions are sold at art auctions for 57% less than unique sculptures.

The *Artists Nationality* and *Production Year* were also dropped from the regression due to collinearity. The results of the final hedonic regression are presented Table 1.

All of the variables groups are statistically significant at a 1 per cent level as indicated by joint F-test results. Only 23 out of 180 Artist names are not statistically significantly different from the base artist, Agustin Cárdenas.

Next, using the equation below, the percentage change in sculpture price caused by the change in each respective dummy variable relative to the base (excluded) variable was calculated.

$$(100 \times (e^{\beta_i} - 1))$$

While specifics can be calculated, for example, demonstrating that Henri Matisse's sculptures are priced 3328 percent higher than the benchmark artist (Agustin Cárdenas) and that the least expensive sculptures are those by Albert Féraud (79 percent below Cárdenas'), the fact that the artist's name contributes the greatest proportion of the value in these regressions is of more importance. When the regressions are run with just the artist dummy variables, the explained variance in prices is about 45 percent (adjusted *R*-squared). The adjusted *R*-squared increases by a bit over 0,24 after the full model is used (see Table 1). This tends to support the Artworld

Table 1: Results of the OLS hedonic regression for the entire sample

Variables	Coefficient	Robust Std. Error
Artist dummies	~	~
<i>F</i> (180, 63143)	275,66	
Prob > <i>F</i>	0,000	
Year dummies	~	~
<i>F</i> (28, 63143)	83,07	
Prob > <i>F</i>	0,000	
<i>Auctionhouse</i>		
Sotheby's NY	0,756	0,017***
Christie's NY	0,696	0,018***
Sotheby's London	0,729	0,017***
Christie's London	0,727	0,020***
Other Auctions	-0,267	0,013***
<i>F</i> (5, 63143)	1462,81	
Prob > <i>F</i>	0,000	
<i>Sale Season</i>		
Winter Sale	-0,051	0,019***
Spring Sale	0,199	0,017***
Autumn Sale	0,159	0,017***
<i>F</i> (3, 63143)	156,79	
Prob > <i>F</i>	0,000	
<i>Material</i>		
Ceramic	-1,169	0,036***
Other Metals	-0,008	0,023
Steel or Iron	0,083	0,032***
Wood	0,017	0,037
Mixed Media	-0,180	0,024***
Terracotta	-0,467	0,034***
Resin or Polymers	-0,597	0,036***
Plaster	-0,432	0,038***
Marble or Stone	0,452	0,034***
Other	-0,249	0,029***
<i>F</i> (10, 63143)	161,23	
Prob > <i>F</i>	0,000	
Size	0,551	0,115***
Size squared	0,057	0,015***
<i>F</i> (2, 63143)	9670,90	
Prob > <i>F</i>	0,000	
Life Status	-0,132	0,018***
Estimate Range	-0,249	0,023***
Signature	-0,026	0,012**
constant	5,912	0,223***
N. of observations	63 375	
<i>R</i> ² -adjusted	0,69	
<i>F</i> (231, 63143)	706,98	
Prob > <i>F</i>	0,000	

estimate of who is most lauded by critics but provides little insight into what it is that creates value apart from having an established reputation. Along the same line, sculptures of living artists have 12,4 percent lower prices than those of deceased artists. Presumably, this is due to future scarcity. Another major contributor to Artworld value was the material used in the sculpture. Marble and Stone sculptures have fetched 57,2 percent higher prices compared to Bronze sculptures (the benchmark variable). Ceramic sculptures, on the other hand, had the lowest prices, 68,9 percent lower than the benchmark medium bronze. Thus, when purchasing sculpture, if no other information is known, natural materials provide higher artistic value than other materials. When it comes to the size of a sculpture, price increases with sculpture size. The squared size term is also positive and statistically significant, which indicates that price increases do not diminish with size increases. The presence of an artist's signature, stamp or inscription decreased the prices by 2,5 percent. That is, it is marginally

better to have an unsigned piece than a signed one. The auction house experts' opinion is also significant in determining sculpture prices in our sample. We used the relative length of the high-low estimates to proxy for how certain the auction house experts are in their appraisal. The negative sign of the coefficient indicates that the confidence in the pre-sale appraisal increases sculpture prices.

Leaving aside characteristics associated with the sculptures themselves and looking, instead, at the sellers, prices at Sotheby's auction houses were marginally higher than in Christie's auction houses. Although, the difference between these two auction houses is statistically significant in only New York. The presumption, here, is that the auction houses themselves have reputations in the Artworld that either through their ability to verify the work or through their selectivity in offering it, increases the willingness of purchasers to use these sources. Perhaps another factor, possibly related to human propensities to categorize, to use short-cuts in their assessments or some other behavioural factor is in operation here. These have not been examined but the question arises again when we see that Spring and Autumn sales are relatively on par and increase prices 22 and 17,2 percent respectively over the benchmark season, Summer. Prices during the Winter sales are 5 percent lower than Summer season prices.

We recognize that we have used rather vague proxies for Artworld value in this analysis. The assessment of what makes an artwork art, when separated from experience and focused on the universal norms for the period seems to relegate value to very general qualities that, apart from the artist and, perhaps, the material, have little information for an investor to use in judging what may be an appropriate price. This does not mean that an artist's reputation is irrelevant. Nor does it mean that the medium used is not a contributor to value. Clearly, the Artworld judgment that a particular work is to be highly commended is a factor to be considered and one, which, for the

uninitiated, leads toward a reliance on specialists for appropriate guidance and advice. Because of these limitations, we went on to examine aesthetic value or the subjective experience produced in the viewer given a particular sculpture.

Our second analysis originally focused on all of César's artwork. This enabled us to include some additional factors that are related to the sculpture itself and are of a more aesthetic nature. These new variables in the hedonic pricing regression are sculpture characteristics, such as color, shape (3D versus flat), style and uniqueness (Table 2).

The uniqueness variable is not an aesthetic variable, but included as a control variable to capture the effect of scarcity on sculpture prices.

Thus, we found that, sculptures produced in editions of ten or less are higher priced compared to the ones in multiple editions. The color as a group categorical predictor is statistically significant, with red colored sculptures being cheapest. Three-dimensional sculptures are, unsurprisingly, more expensive. César's work can be categorized into six different styles: Abstract,

Table 2: Results of the OLS hedonic regression for the César sample

Variables	Coefficient	Robust Std. Error
Year dummies	~	~
<i>F</i> (27, 939)	7,47	
Prob > <i>F</i>	0,000	
<i>Auctionhouse</i>		
Sotheby's NY	0,401	0,333
Christie's NY	0,233	0,232
Sotheby's London	0,553	0,164***
Christie's London	0,392	0,127***
Other Auctions	-0,202	0,067***
<i>F</i> (5, 939)	5,95	
Prob > <i>F</i>	0,000	
<i>Material</i>		
Aluminum	0,323	0,160**
Steel or Iron	0,723	0,109***
Other Metals	0,156	0,138
Gold	1,333	0,204***
Resin or Polymers	-0,506	0,143***
Glass or Crystal	-0,173	0,226
Other Media	-0,366	0,190*
Mixed Media	0,116	0,219
<i>F</i> (8, 939)	17,37	
Prob > <i>F</i>	0,000	
<i>Style</i>		
Abstract	-0,648	0,137***
Animal	-0,266	0,116**
Compression	-0,150	0,125
Expansion	-0,885	0,122***
Human	-0,345	0,127***
<i>F</i> (5, 939)	17,55	
Prob > <i>F</i>	0,000	
<i>Color</i>		
Yellow	0,315	0,181*
White	-0,156	0,148
Transparent	0,097	0,245
Red	-0,311	0,137**
Grey	0,128	0,153
Green	0,238	0,164
Golden	0,084	0,135
Brown	0,126	0,122
Blue	0,133	0,141
Black	-0,067	0,175
<i>F</i> (10, 939)	2,06	
Prob > <i>F</i>	0,025	
Uniqueness	1,150	0,085***
Estimates Range	-0,711	0,246***
Shape	1,115	0,098***
Size	1,042	0,040***
constant	3,301	1,164***
N. of observations	999	
<i>R</i> ² -adjusted	0,78	
<i>F</i> (59, 939)	77,31	
Prob > <i>F</i>	0,000	

Animal, Human, Expansion, Compression and Imprints. The latter variable is used as the benchmark variable and, thus, omitted in the regression). Out of these, Imprints and Compressions got the highest price in our sample, while Expansion style sculptures, largely employing various resins, were the cheapest. With the addition of these new variables the amount of variance explained in sculpture prices rises to over 77 percent. Thus, employing all (999) of César's sculptures, two variables that related to more aesthetic considerations (colour and dimensionality) could be isolated as having a significant impact on price.

Probably the most all inclusive aesthetic term we associated with sculptures at large, with our pilot study participants, was that they were evocative. They drew on respondents' experiences, or, as the term is defined in the on line Encarta Dictionary, they "prompted vivid memories or images of things not present, especially things from the past". The fact that Dewy's entire text dealt with the ties between experience and aesthetic response, it was difficult to have this term take us very far in our attempt to isolate aesthetic terms from Artworld descriptions. However, by breaking the terms used down further and comparing them with Dewy's explanations of the aesthetic experience, we found that several terms could be isolated from among those grouped as evocative. Among these were "emotive", "imaginative" and "humorous" or "spontaneous". We have attempted to use these terms as Dewy defined them. Thus an "emotive" reference indicates a sculpture that allows for an interaction between the artist and the observer. The artwork must have some tension or resistance that is communicated to viewers. Going further, if an artwork was to be considered "imaginative", it had to be in some respect transfiguring, to force a consideration of new inter-relationships. The term "humorous" came not from Dewy but from our respondents. The closest term we could match to this, from Dewy's descriptions of the experience of art was "spontaneous". It seemed, at least to us, that if someone laughed aloud at

the first sight of a sculpture; that was both a spontaneous response and an indication of the artist's humour being well communicated. The difficulty in applying these terms lay more in the subjectivity of the experience of each factor. Our descriptions here are an attempt to explain how these terms were applied in as objective a fashion as possible. A drawback at this stage is that we have only applied these terms to a new data set of sculptures by agreement between the two authors. Further objectivity might be achieved by using a survey among a number of investors defining our terms and asking them to examine each piece and tick whether or not the terms apply. At this stage of our research, however, we are only trying to determine the plausibility of this approach. We may seek to refine it further if it produces results that are commensurate with the effort involved. From among these terms, after controlling for size, the sole variable that was significant was "imaginative". The standard error, significant at a 5 percent level, was estimated by bootstrapping with 5000 repetitions. The coefficient estimate has a positive sign indicating that the sculptures that were deemed imaginative or transfiguring command prices 71 percent higher than the sculptures that were not.

More descriptive, yet still aesthetic, terms were easier to apply. Our respondents had indicated that some pieces felt "dynamic, "fluid" or "energetic", while others were "still" or "frozen". We believe that these descriptions are well captured in the term "lyrical" as used by Dewy. Dewy's description of the term came from music when he described a "lyrical" artwork as one which had a defined rhythm, was not abrupt or staccato. We considered a piece lyrical if it had fluid lines, an easy movement between parts. A similar term, which we separated from "lyrical", was "patterned". This, too, in the context of Dewy, probably came from an analysis of music as when one hears a musical phrase repeated in some way – by another instrument for example. We applied the term patterned to any sculpture that contained this sort of repetition.

“Balance” is a dichotomous variable referring to the sense of being finished or whole versus a sculpture that feels incomplete, unfinished, incoherent or contradictory. Dewy defined “balance” as harmonious or proportional.

While our original exploratory study included the term colour, and while that term was significant (at least when red coloured sculptures were considered), that was less relevant for these bronzes. While it was true that different patinas were applied and that some, in particular the brown patina, dulled the reflective qualities of the sculpture, a more appropriate term and one also offered by Dewy, was “contrasts”. The term was easily applied to artworks that contrasted light and dark, over which light played or was periodically absorbed.

Textures were commonly described by respondents in our exploratory study. They suggested that the sculptures were “prickly” or “sharp”, “pitted” or “smooth”; they also stated that some pieces were “hard”, “solid” or “heavy”. Given that we limited our pricing regressions to bronzes, the tactile nature of all pieces was difficult to deny and, hence, was left out of the aesthetic factors used. We did, however, include the idea of “density”, defined by Dewy as solidity or as not being ephemeral. Density seemed to vary considerably between pieces and here we have simply applied a scale (between one and ten) after lining up all the sculptures and comparing them one to another. This is the only factor where an ordinal scale has been applied to a variable.

Discussion and Conclusion

We began this paper with the idea that it would be possible to isolate the factors or characteristics that contribute to value in sculptures. After examining previous research in both pricing and in the realm of aesthetics, we divided our variables into three categories of value determinants, those usually related to economics, those related to artistic value and those related to aesthetic

value. Approaching the valuation of sculpture from an economic perspective is unusual but, we felt, worth the effort to make this form of investment more transparent.

It is interesting that our strongest component of economic value is an Artworld recognition of the artist's reputation. This reinforces the need for a reliance on experts in an informationally inefficient, small, non-homogenous market. Other Artworld factors that had a significant impact on a sculpture's price included material and the auction house involved in the sale. More economic factors related to scarcity, such as multiple editions of a piece or the death of the artist, also impacted price. Aesthetic characteristics which are much harder to isolate, also appear to be relevant when pricing a sculpture. We could identify these only in relation to César with the general results that red sculptures had a negative impact while 3 dimensionality was positive. Looking only at bronzes and applying aesthetic terms derived from respondents and Dewy, gave us the further insight that *imaginative* works, or works that challenged the viewer to look at objects in a new way, also added value.

These results, at this stage, feel incomplete. Aesthetic variables do contribute to value albeit at an apparently lower rate than do artistic (Artworld) variables – particularly reputation. We would like to go further and gather more objective assessments of aesthetic variables through a broader survey of investors. At this stage, however, Artworld critics and aestheticians continue to have a firm grip on the information that is relevant to investors in determining prices in this specialized market.

An additional problem with the approach we have taken is that the pricing of particular aesthetic characteristics that could be applied in a price index at this stage, would only be relevant to work by César and, in this case, to his bronzes. To further understand the importance of these aesthetic

variables, we would have to run similar regressions with a number of different artists until we began to have some mean coefficients that could be said to contribute to sculptures across the board. We would then have to test our Artworld, economic and aesthetic variables against yet another random set of sculptures to determine whether we were accurately predicting price.

While we are unable, with the results we have produced to date, to provide an ideal or even a limited price index, we do believe we have sufficient evidence to suggest that the project is plausible. Even with the constraints we imposed, we have been able to isolate a few relevant pricing variables. They do indicate that the experts, whether consciously or not, are applying considerations beyond those that exclusively belong to Artworld categorizations. Experts focus on an artist's reputation, on the material used and the size of the piece and can describe this as the basis of their price estimates. However, their estimates also include uncaptured aesthetic variables that are possible to isolate. Understanding what these characteristics are would provide greater transparency in a small and specialist market that could be used to open it up further to a greater number of participants; ultimately leading to greater efficiency.

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Appendix 1: Artists, the number of sculptures sold and their mean prices in the period 1985-2013

Artist Name	Mean Price	Number of Sales
Auguste Rodin	203 837	2009
Carl (Wilhelm Emile) Milles	19 384	439
César	39 020	1441
Hans Arp	120 315	808
Henry Moore	297 036	1723
Jean-Baptiste Carpeaux	18 931	573
Niki de Saint Phalle	62 790	746
Pablo Picasso	54 259	2879
Sir Jacob Epstein	14 199	533
Agustin Cárdenas	26 208	297
Aimé Jules Dalou	9 311	622
Alberto Giacometti	1 459 140	620
Alexander Archipenko	110 575	435
Alexander Calder	610 803	1062
Anish Kapoor	508 690	157
Anthony Caro	47 108	255
Antoine-Louis Barye	9 845	2228
Aristide Maillol	273 243	480
Arno Breker	7 757	305
Barbara Hepworth	212 342	318
Camille Claudel	228 731	133
Claes Oldenburg	88 090	301
Donald Judd	495 889	472
Elisabeth Frink	70 849	564
Émile Antoine Bourdelle	44 732	414
Emmanuel Frémiet	4 935	576
Ernest Barrias	17 869	192
Ernst Barlach	70 177	415
François-Raoul Larche	8 265	177
Franz West	44 536	175
Frederic Remington	239 583	269
George Rickey	57 973	375
Henri Laurens	155 427	301
Igor Mitoraj	16 800	244
Isamu Noguchi	223 771	185
Jacques Lipchitz	182 129	347
Jean Alexandre Joseph Falguière	5 932	192
Jean Jacques Pradier	6 532	224
Jeff Koons	738 692	538
Joan Miró	276 556	254

Käthe Kollwitz	28 035	172
Louise Bourgeois	715 824	138
Louise Nevelson	43 876	591
Malvina Hoffman	9 765	121
Marius Jean Antonin Mercié	11 679	244
Mark di Suvero	58 890	154
Miguel Berrocal	3 324	947
Ossip Zadkine	70 807	286
Paul Dubois	4 248	217
Paul Howard Manship	112 413	156
Rembrandt Bugatti	183 318	402
Robert Graham	18 017	195
Robert Jacobsen	10 928	439
Sir Eduardo Paolozzi	17 215	298
Sol LeWitt	81 800	249
Tony Cragg	75 204	141
Wilhelm Lehmbruck	115 965	130
Vincenzo Gemito	8 354	183
Yaacov Agam	10 608	152
Yayoi Kusama	62 032	284
Albert Feraud	2 746	205
Augustus Saint-Gaudens	58 610	114
Chana Orloff	33 162	204
Joel Shapiro	99 166	130
Marino Marini	449 975	268
Prince Paolo Troubetzkoy	25 014	270
Claude Michel Clodion	15 602	174
Frederick William MacMonnies	25 922	145
Carl Andre	160 423	214
Robert Rauschenberg	34 750	199
Günther Uecker	62 894	203
Alfred Hrdlicka	6 600	216
Constantin Meunier	6 551	194
Pierre Jean David d' Angers	13 341	186
Charles Marion Russell	73 153	179
Giacomo Manzù	94 104	300
Ewald Mataré	26 638	302
Damien Hirst	685 303	271
Daniel Spoerri	12 217	276
Kenneth Armitage	43 006	147
Robert Indiana	468 824	143
Henri Matisse	1 337 521	136
Auguste Nicolas Cain	3 551	123

Bessie Potter Vonnoh	22 835	135
Georges Braque	35 696	100
André Derain	17 862	136
Barry Flanagan	171 309	140
Jean-Léon Gérôme	33 531	210
Ernest Tino Trova	7 777	216
Ernst Fuchs	2 263	216
Pol Bury	22 853	221
Roy Lichtenstein	277 023	213
Heinz Mack	26 371	221
Honoré Daumier	21 246	299
John Chamberlain	244 444	336
Takis (Panayiotis Vassilakis)	15 240	313
Joseph Csaky	15 830	266
Reg Butler	21 335	163
Kai Nielsen	1 605	165
Emilio Greco	29 161	149
Marc Aurèle de Foy Suzor-Côté	14 694	155
Anna Vaughn Hyatt Huntington	14 607	155
Henry Heerup	7 013	146
Sandro Chia	19 257	137
Jean Dubuffet	240 977	138
Michael Ayrton	12 861	195
Takashi Murakami	304 457	170
Richard Artschwager	31 202	180
Julio González	349 482	162
Sorel Etrog	14 695	163
Edoardo Villa	10 666	173
Joseph Cornell	253 537	155
Jean Tinguely	107 370	196
William Zorach	17 159	208
Stephan Balkenhol	42 991	195
Pietro Consagra	17 741	192
Nam June Paik	52 021	151
Jean-Baptiste Clésinger	13 147	180
Jörg Immendorff	24 120	157
Bruce Nauman	420 376	105
Franz von Stuck	20 952	140
Marcel Duchamp	128 557	124
Paul Gauguin	165 183	122
Baltasar Lobo	70 469	137
Alicia Penalba	13 890	130
Wifredo Lam	7 635	128

Antoni Clavé	10 101	92
George Minne	19 300	257
Fritz Wotruba	20 932	247
Fernando Botero	303 114	248
Fausto Melotti	54 733	260
Emile Gilioli	9 408	229
Chaim Gross	5 845	235
Giorgio de Chirico	23 289	220
Andy Warhol	129 766	225
Germaine Richier	123 722	226
George Segal	55 066	221
Arman	19 290	3503
Eric Grate	7 239	127
Leonard Baskin	6 456	120
Fritz Koenig	16 063	126
Diego Giacometti	74 923	1085
Salvador Dalí	13 869	2128
Edouard Marcel Sandoz	9 579	334
Fritz Klimsch	16 948	346
Georg Kolbe	49 278	320
Pierre Jules Mène	4 400	1779
Lynn Chadwick	52 613	947
Max Ernst	68 519	453
August Gaul	6 970	423
Jef Lambeaux	2 825	323
François Pompon	31 876	382
Gerhard Marcks	17 063	353
Mathurin Moreau	5 465	498
Francisco Zúñiga	63 013	493
Harry Bertoia	34 268	942
Lucio Fontana	96 240	761
Jesús Rafael Soto	66 125	417
Yves Klein	113 584	406
Arnaldo Pomodoro	54 477	608
Renée Sintenis	11 214	736
Joseph Beuys	26 855	668
Albert Ernest Carrier-Belleuse	9 183	756
Bernhard Hoetger	5 620	116
Mané-Katz	5 059	104
Juan Muñoz	300 928	118
Eduardo Chillida	479 377	121
Gerhard Henning	4 090	122
Menashe Kadishman	5 559	123

A.R. Penck	6 932	101
Cyrus Edwin Dallin	27 205	116
Robert Edward Klippel	29 813	111
Gustav Seitz	5 883	119
Bernard Meadows	13 714	115
Giò Pomodoro	11 344	119
Victor Rousseau	4 849	94
Max Bill	38 098	111
Rosa Bonheur	2 297	97
Gaston Lachaise	47 979	105
Lynda Benglis	22 145	117
Ferdinand Barbedienne	3 217	101
Total (181)		65473
