Analyzing Youth Premium in the Contemporary Art Auction Market

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1 Introduction

To a layman's eye, the contemporary art market might seem like capitalism's vanity gone wild. Visual inspection alone is not enough to comprehend the price tags that gets attached to a piece of artwork. The exorbitant price put towards a piece of work, seemingly simple in their reproduction, is puzzling. However, the monetary value of an artwork is not bounded within its frame. Similar to its artistic merit, an artwork's monetary value also stretches out through history and people. Therefore, one must step outside the frame and observe the surrounding: the place, and the people in conjunction with the sale of an artwork. This paper aims to step outside the frame by utilizing the recent auction house data of contemporary paintings. By utilizing a large volume of data, this paper intends to highlight certain trends that occur in the auction market, while trying to explain the consumer's motivation behind the valuation of art.

This paper will follow the general outline of a data analysis project. First, the paper describes the outline of how an auction house functions and moves on to discuss the past literature on analyzing art prices to establish some background. Then, it will move forward to attaining data and a quick overview of the collected data. Modeling on the data will follow immediately to investigate the current behavior in the art market.

2 The Art Market

The art auction market stands out to economists as a market unlike any other. First, the sales account of a specific piece of artwork is scarce. Both collectors and investors, albeit for different objectives, tend to hold on to the artwork. Therefore, multiple observations for a single artwork rarely occurs in a prolonged period. With usually few recent transactions, the price of a piece depends on the qualitative evaluations of certain individuals. This leads to the second characteristic of the market that valuation is done from an expert's, a non-direct consumer's, point of view rather than the valuation of the utility derived from the product. Despite art being a public good in most situations, the art world itself is run by the elite few. The so-called experts of the art world, usually distinguished by the fame of their writing or degree, assign value according to their intuition accumulated with knowledge and taste. For all artworks in an auction event, buyers observe the price estimate before bidding starts.

In addition to the expertise of the auction house, the owner's price opinion is also reflected in each sale. For each item, individual owners set a minimum threshold of their inclined sales price. Only after the bidding is complete does

the auction house disclose whether the sale was valid to the highest bidder: the transaction is complete only if the highest bidder's asking price surpasses the winner's bid. Thus, contemporary art demand is sometimes not even visible due to various bars it has to overcome before the price is realized. This is more likely to drive the prices up in the art market since the suppliers possess the upper hand. Since most art pieces are unique goods, the suppliers hold a monopoly over the entire market, or worse there is no market for certain products if the institution or collectors have no intention of making a sale. Note that buyers are also relatively few. Art is, in a culture-valuing society, a public good where people can enjoy its utility without necessarily having to own the product itself. Thus, buyers are usually the institutions that are willing to share the good of an art piece or collectors who derive utility from ownership or future earnings from the resale of the product. Since these buyers are wealthy, they are rather price inelastic, meaning the variation in the price has a lesser impact on their willingness to purchase the product. Knowing this, owners will tend to put a higher threshold when submitting their possession to the auction house. The auction house, in turn, is more likely to increase their appraisal since their earnings are based on the proportion of a successful sale. This unique structure of auction sales can be one reason why the art market seems overpriced to the general public.

3 Past Literature

Despite the uniqueness of the market, a few economists have tried applying their quantitative methods to analyze the auction house mechanism and resulting art prices. Professor Mei and Moses focuses on viewing the artworks as investments.[1] The paper used repeated sales regression on the repeated sales

data on a single painting with more than 4000 records of sales. By modeling the regression on the logged ratio of price relative to repeated sales observation, the paper notes that there is a higher systematic risk on art compared to bonds, which should earn a higher return than bonds over the long run. The paper also noted that masterpieces, characterized by their extreme price, tended to underperform in the investment market. (Ashenfelter Graddy, 2003) focused on analyzing the price only.[2] Again, this paper also utilized the repeat-sales method to model the art price as a combination of the unique fixed character of an art piece plus the index of aggregate movement in the art market. They also highlighted the underperformance of masterpieces, due to overbidding and mean reversion. In addition, both papers emphasized that the law of one price does not always hold for an art piece, meaning that geographical locations can induce price variation of the same good.

The analysis might be rather limited to viewing the contemporary trends in the auction market since both papers use datasets that contain repeated measurements. Sales of the same piece are scarce. The fame of the artist and the trend of the general market has a great influence on what items are sold. The owners of the art pieces are rather reluctant to sell in the short term for maintaining its status as a public good or exercising a larger gain from the sales. Therefore, the analysis is only applicable to those selective paintings. The gap between the pre-contemporary and contemporary era in the market is another ambiguity. Art goods take a long time to stabilize: meaning that a classification of artwork towards a movement or era only happens after a certain accumulation of concurrent genre. This stabilization usually takes half a century when all the creators have passed away. Most works that have not been stabilized are labeled as contemporary. Combining these disparate sets of data might not shed useful behavior of the current auction houses. Rather, the analysis of works with

repeated sales will tend to focus more on the pre-contemporary data. In order to analyze current behaviors in the auction market, it is important to consider the contemporary data as well. This paper intends to give insight to the current auction house system and the investor's and collector's behavior.

4 Data

Contrary to past literature, this paper tries to focus solely on the current characteristics of the auction market by analyzing the works of those who were born within the 20th century. By fixing the birth date of the artist, the paintings traded in the auction houses have a lifespan of less than 100 years, which is considered short in the art history timeline. By doing so, this paper aims to uncover any price mechanism or behavior in the current auction houses.

Data collection, in a field as scarce as the art market, is always difficult. First, there is no transparent art market. Either the buyers and sellers meet in a gallery to discuss their private dealings, or the auction houses' data does not disclose the seller's minimum sellout price in any event. Secondly, the majority of auction house data is managed by few since there is an oligopoly in the art market. Renowned auction houses, Soetheby's and Christie's, account for more than 80% of the global art world, which is valued at around $67 billion as of 2019. These giant dealers try to protect their data. Thus, web crawling is difficult since the site is designed to be defensive from crawling.

With the use of "Scrapy" crawling framework of Python, it was possible to crawl Christie's auction results. Since total automation of crawling was difficult, the author personally had to choose individual events to crawl. Auction events that focused mostly on paintings and artists born after 1900 were se-

lected. However, the data still contains mixtures of paintings and other forms of art. For a broader analysis, 10 years worth of data was collected from 2010 to 2019. For the ease of analysis, works composed by artists in collaboration were discarded. Also, we note that the price of unsold artwork which came up in auction is not included as well. After the filtering for artists born during the 20th century, there were a total of 35,107 sales accounts of contemporary artworks from Christie's auction houses located in 7 different cities.

5 Expository Analysis

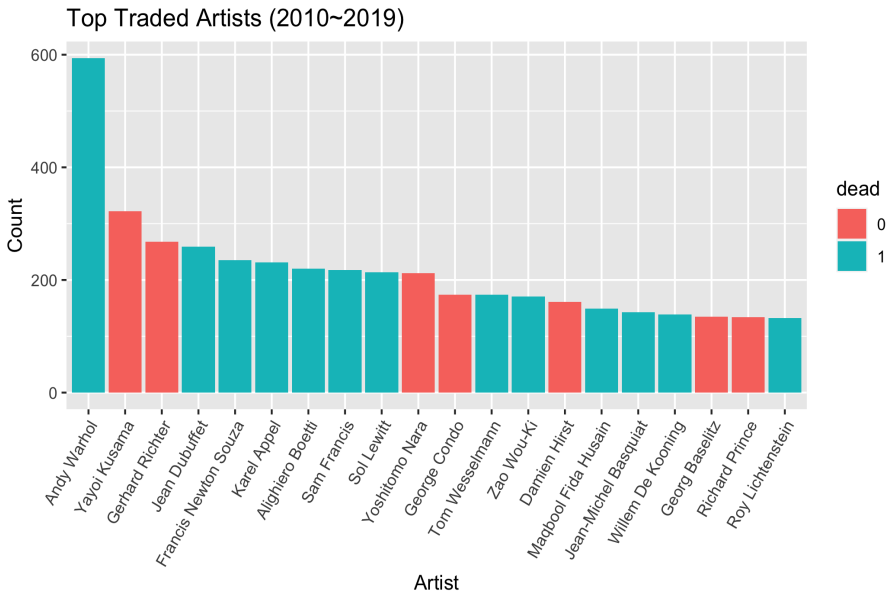

Fig. 1: Top Traded Artists Born After 1900 in Christie's Auction House

Ironically, the contemporary art market is mostly dominated by dead artists. Despite only looking at artists who are born in the 20th century, the majority of artworks traded are from artists who passed away. The top traded artist

is the renowned father of pop art, AndyWarhol, whose creation, ranging from simple signatures to canned soup prints, comes with a price tag. The sales account reaches up to 600 sales, which is almost double the runner-up's traded volume. The second and third most traded artists are Yayoi Kusama and Gerhard Richter, who solidified their style through extended careers; the former marked by her spotty repetitions, and the latter by his jumbled abstraction of diverging colors. Other than those two, all the remaining top ten most traded artists have passed away. This indicates that the market's taste is more towards conservative artists, those who managed to pin their name alongside luxury brands.

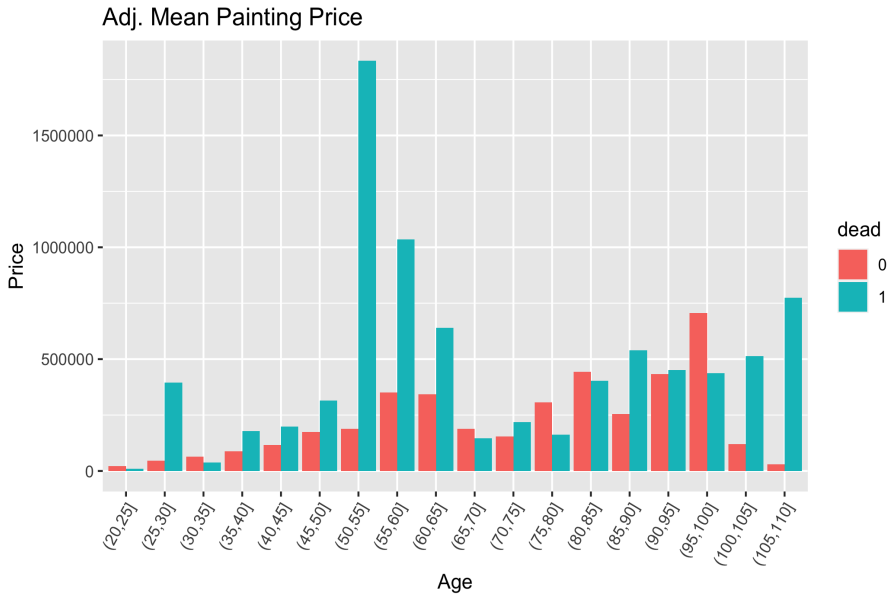

Fig. 2: Nominal Price Averaging over Age Group

The art market is indeed marked by high variation in the price level. Since the data is spread out through seven different cities, the prices were all fixed against the dollar. Note also that the age is calculated when the sale is made. The graph, despite being the aggregated mean price of different age groups,

shows interesting features. For dead artists, the price is highest around the age 50 to 60. This is mainly because of outlier artists in that group. In particular, Jean-Michel Basquiat is the most expensive artist who passed away in the late 80s. Discounting these outliers, the average mean price tends to increase as the artist gets older. Notably, the expensive alive painters are concentrated also in the age 55 to 60. In general, the price of artists who have passed away is higher than the artists who are alive.

Fig. 2: Standardized Price Averaging over Age Group

Since the price is only measured in absolute terms, we cannot see whether one artist is valued higher than another in relative terms since large disparity exists between artists due to their fame or stature. One way to offset the nominal sales price is to account for auction house expectations. We divide the price by the geometric mean of the high and low expectation to standardize the nominal price. This composite value measures how much the sales price deviates from expectation given the size of the price range. We can see that other than the

noted extreme values in the age range between 50 and 60. The scaled price is similar between both living and dead artists, which means being dead does not put much premium on the sales of the artwork.

6 Modeling

This paper hypothesizes the existence of "youth premium", where buyers tend to overvalue the works of younger artists. As observed in the previous section, the nominal price of a painting tend to increase relative to the artist's age. From an investor's point of view, buying works of younger artists could be a lucrative investment opportunity as their general price level will increase as their career matures in the art world. In this regard, artwork is comparable to an option product, where investors are willing to pay a premium of gaining larger volatility into the future. Then, the investor's preference to monetize the youth premium should be evident in the sales of younger artists' work in today's auction house.

We use the mixed model regression to investigate this hypothesis. The collected data provides the date, artist, birth year, death year, location, specific event name, and the related price information of a sale. Since artists have varying levels of stature in the market, the artist is included as a random effect in the model. The age, whether the artist has passed away, the location and year are included as fixed effects of the model. The response variable is the log of the price value. The price standardized by the geometric mean of minimum and maximum expected price is one of the options, however, the resulting values are rather sporadic and does not form a normal distribution. Instead we standardize the price by including the combinations of the expected price range as the fixed effects. $0.5 * \log(HIGH * LOW)$ is the geometric mean of the minimum and

maximum price expectation. We would expect this value to be close to one since the sales price is directly derived from the price range of the auction house thus forming a unit linear relationship. $\log \frac{HIGH}{LOW}$ is the log price range of the lot which should have high correlation with the sales price. Thus, the initial model and its result is outlined below and Table(1) and Table(2) contains the regression results. Note that the intercept is coefficient of the artworks of youngest artists, sold in Amsterdam, 2010.

$$\log(PRICE) = \beta_0 + \nu_{0i} + \beta_{AGE} + \beta_{YEAR} + \beta_{LOCATIONS} + \beta_{RANGE\_MEAN} + \beta_{RANGE} + \epsilon_{ij}$$

$$\epsilon \sim \mathbb{N}(0, \sigma_\epsilon^2)$$

$$\nu_{i0} \sim \mathbb{N}(0, \sigma_\nu^2)$$

	Estimate	Std. Error	t value
(Intercept)	6.6985	2.0920	3.2019
AGE	0.0034	0.0003	12.7734
YEAR	-0.0030	0.0010	-2.9030
LOCDubai	0.0278	0.0225	1.2367
LOCHong Kong	0.1208	0.0171	7.0603
LOCLondon	-0.0521	0.0121	-4.3195
LOCMilan	-0.1156	0.0239	-4.8369
LOCMumbai	0.1696	0.0726	2.3361
LOCNew York	-0.0609	0.0125	-4.8744
LOCParis	0.0143	0.0166	0.8620
LOCShanghai	0.1042	0.0293	3.5594
LOCZurich	-0.3178	0.0755	-4.2070
I(log(HIGH * LOW)/2)	0.9551	0.0020	485.8289
log(HIGH/LOW)	-0.2326	0.0294	-7.9124

Table 1: Fixed Effects Estimates for Model 1

	grp	var1	var2	vcov	sdcor
1	NAME	(Intercept)		0.0864	0.2939
2	Residual			0.2039	0.4516

Table 2: Random Effects Estimate for Model 1

From the result, we can see that the artists' age is significant but its impact is minimal. We also note the coefficient of the geometric expectation is not one which means that the auction house may not always be correct in its estimation. On the other hand, it could also seen as auction house not always having the power to be the price maker in the auction house. The range covariate is negative which indicates that the wider the price expectation range of auction houses makes it less likely to be sold at a higher price. The artist random effect is significant with bootstrapped likelihood test's p-value very close to zero. Nevertheless, the degrees of variation is not big due to the auction house incorporating this randomness in their price expectation. Since we want to see more distinctive effect of the age covariate. We divide the artist into different groups. Initially, we divide the age into three different groups by segmenting the age range into three. The youngest are the artist who debuted most recently. The middle group is where the artist is beginning to develop one's own style, and the eldest group is where an artist's name has solidified into a significant brand. The debut and growth of an artist might vary, however, we assume that the career growth spans proportionally with age, thus dividing our age range into equal groups. For artists who already passed away, we also group them into another group disregarding the age. Since death of an artist makes the work limited, whether the artist is alive or not should be a crucial component for a prospective buyer. In addition, for a more coherent analysis, different locations are group into continents for the next model. The model equation is relatively similar to the above, except that the age covariate has been changed to YOUNG groups. The baseline of this group is the youngest artists, while the last group represents the artists who have passed away at the time of the sales. The results of the second model is outlined in table(3) and table(4), note that the intercept is the sales of the youngest group in China, 2010.

	Estimate	Std. Error	t value
(Intercept)	3.2555	2.0439	1.5928
YOUNG1	0.0377	0.0119	3.1733
YOUNG2	0.1963	0.0161	12.2076
YOUNG3	0.1669	0.0142	11.7933
YEAR	-0.0012	0.0010	-1.1618
REG_EU	-0.1585	0.0134	-11.8290
REG_US	-0.1784	0.0132	-13.5121
REG_W. Asia	-0.0837	0.0216	-3.8713
I(log(HIGH * LOW)/2)	0.9546	0.0019	492.4043
log(HIGH/LOW)	-0.2352	0.0293	-8.0261

Table 3: Fixed Effects Estimates for Model 2

	grp	var1	var2	vcov	sdcor
1	NAME	(Intercept)		0.0868	0.2945
2	Residual			0.2039	0.4516

Table 4: Random Effects Estimates for Model 2

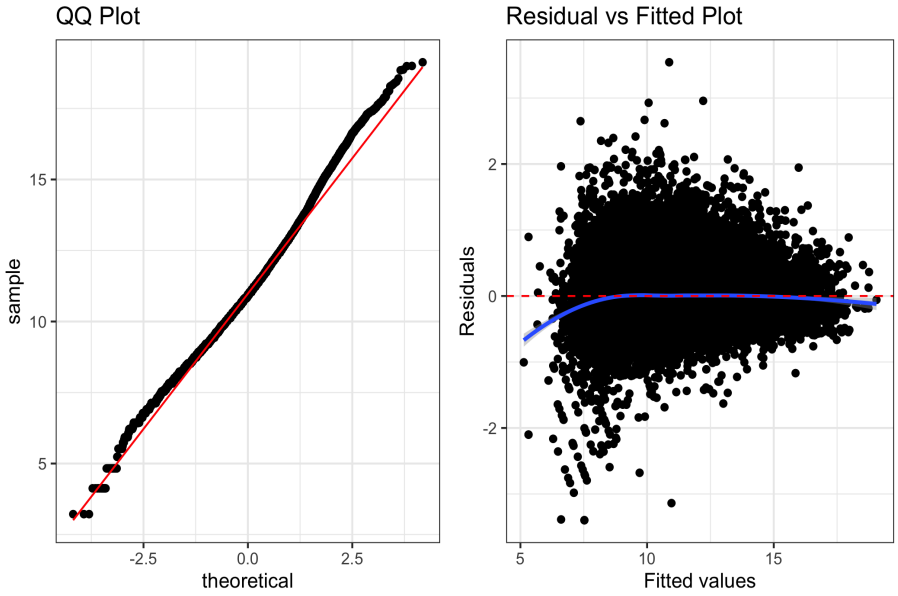

Fig. 4: Model 2 - QQplot and Residual Plot

Judging from the qqplot and the residual graph, the distribution of the log(price) follows the normal distribution. The residuals also show no evident

pattern. The variance of the residuals seem to decrease as the fitted values increases indicating lower price ends tend to be more variable.

Note that the intercept is the coefficient for the youngest artist group for location in Shanghai, China. Region of West Asia is the combination of Mumbai and Dubai. Looking at the region covariates first, we can see that as the location becomes further from the US, buyers pay more premium in buying artwork. The coefficient for US region, which is solely in New York, is the minimum. This shows that overseas artwork sales tend to be more expensive. However, we have to take into account that there are regional concentration in different locations, meaning that more Chinese work will be sold at an auction house in China. In addition, different locations trade in different currencies. Although this should be offset by including the expectation related variable, it might not be totally offset.

The coefficients for different age groups are interesting. Unlike the hypothesis of existence of the youth premium, the youngest artists tend to be undervalued in the auction market. The price increases with age group just like our initial regression. However, the YOUNG2 coefficient is higher than the dead group, which means that the work of the eldest alive artists are sold at highest prices in auction houses.

Rather than the youth premium, then, there might exist a certain premium over death of the artist. Death makes the artist's art price be more volatile and investors might pay premium for this, expecting it to take effect in the near future. To analyze the effect of death more closely, we subdivide the data into artist who have passed away during the data's ten-year timeframe. These artist are again selected by whether their sales of an artworks were observed both before and after their death. Tallying, there were total 107 artists with total

of 2630 sales combined during the 10 year period. Thus, the data becomes a longitudinal data where there are multiple observations of individual artist in given period of time. Thus, the model posits that effects of death varies between artist. The model and the results are as follows in table(5) and table(6).

$$\log(PRICE_{ij}) = \beta_0 + \nu_{0i} + \nu_{1i}\beta_{DEAD} + \beta_{DEAD} + \beta_{YEAR} + \beta_{LOCATIONS} + \beta_{RANGE\_MEAN} + \beta_{RANGE} + \epsilon_{ij}$$

$$\epsilon \sim \mathbb{N}(0, \sigma_\epsilon)$$

$$\begin{pmatrix} \nu_{i0} \\ \nu_{i1} \end{pmatrix} \sim \mathbb{N}\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix} \begin{bmatrix} \sigma^2_{\nu_0} & \sigma_{\nu_0\nu_1} \\ \sigma_{\nu_0\nu_1} & \sigma_{\nu_1{}^2} \end{bmatrix} \right)$$

	Estimate	Std. Error	t value
(Intercept)	-5.5673	9.4215	-0.5909
DEAD1	0.0083	0.0347	0.2391
I(log(HIGH * LOW)/2)	0.9400	0.0060	157.2368
log(HIGH/LOW)	-0.2453	0.1042	-2.3544
REGIONEU	-0.0760	0.0495	-1.5350
REGIONUS	0.0111	0.0518	0.2149
REGIONWA	0.0759	0.1010	0.7519
YEAR	0.0033	0.0047	0.7121

Table 5: Fixed Effects Estimates for Model 3

	grp	var1	var2	vcov	sdcor
1	NAME	(Intercept)		0.0525	0.2290
2	NAME	DEAD1		0.0281	0.1676
3	NAME	(Intercept)	DEAD1	-0.0231	-0.6019
4	Residual			0.1859	0.4312

Table 6: Random Effects Estimates for Model 3

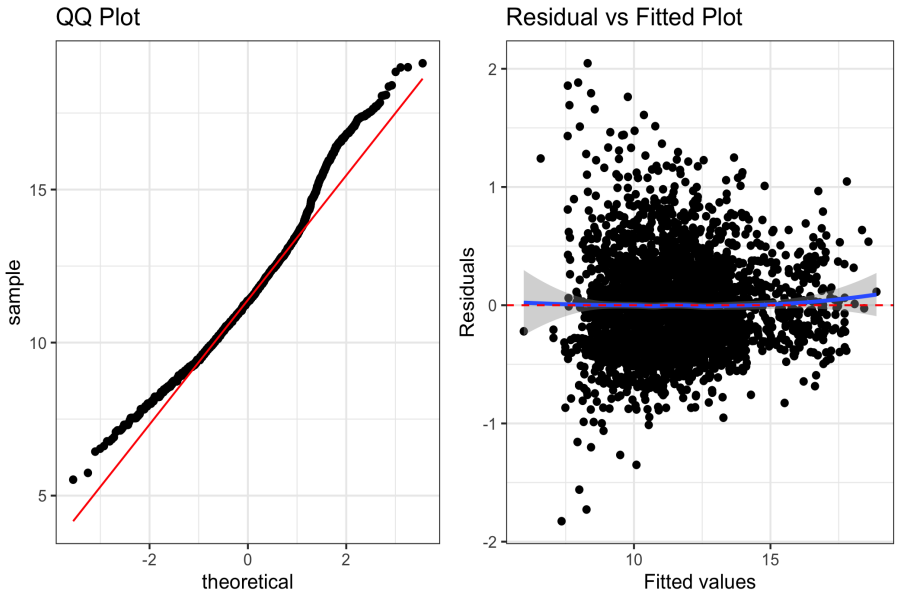

Fig. 5: Model 3 - QQplot and Residual Plot

The third regression model indicates that the effect of death both random and fixed are not significant given the artist and other factors of auction sales. The qqplot indicates there are a little more skewedness than before, and the residual plot shows same tendency of higher variability of residuals on lower price ranges. The only significant covariates are the auction house estimates. Using the ANOVA test, the mixed model with death slope for artist random effect is significant, however, the death random slope is not dominant. Thus, given the sub-samples of artist who passed away between 2010 and 2019. The effect of death is not significant in the sales price of auction. In fact, among all models, the most significant covariate was the auction house estimate of the given lot. This might indicate that the eldest artist group having the highest covariate in model 2 might already reflect the premium of the buyers, thus the event of death itself does not exhibit significant price changes.

7 Conclusion

Through the Christies' auction house data between 2010 and 2019, this paper aimed to highlight the ongoing phenomenon in the contemporary art auction market. By using mixed linear model on the logged price of art sales, the paper analyze the effect of age and location effects on art prices. The major driving force of art prices in the auction house were auction house themselves. The auction house's price expectations was highly related to the actual sales price, more than factors like location or age. This makes sense in when we are valuing a good that is subjectively measured. Most buyers tend to stick to the auction house's expertise opinion. In fact, only 10% of the sales fell below the auction house range, which means auction house can drive the price up by increasing their expectation range on purpose.

The youth factor was not deemed as a premium in the auction house. Rather, the youngest artists' work tended to be sold for less compared to that of older and dead artist. This shows that becoming a successful artist is rather risky matter, something the market is rather averse towards. On the other hand, work of the eldest artist group was sold for the highest in all age groups, more than those artist who have passed away. This shows that the market believes successful artitsts' work would not deteriorate in value even after their death. However, there is a selection bias in this regards since only successful artist survive to become a master. Those who do not get accepted by the market will tend to perish early on, thus the remaining market will be dominated by the mainstream artist with credentials from art dealers or critics.

Further investigation was carried out to investigate the impact of death in the artists' sales price. However, within the ten year time frame, there was not

enough statistical significance to show that death of an artist caused increase in the price. Rather, it is more likely that the price increase in the eldest group would incorporate the effect of the artist death in the near future. This explains why the death effect is relatively smaller when we analyzed the sub-sample of those who passed away during the data's timeframe.

As noted in the past literature, there was a varying locational effect in art auction sales. Auctions in the US was the cheapest and the there were price premiums as the distance became farther away from the US. Given that Christie's is a British firm, it is interesting that the US auction house is Cheaper than the European one, probably due to the fact that contemporary art is most widely traded in the States. Auction sales in China was the most expensive. This could be due to the increasing popularity of Contemporary art in China.

This analysis of contemporary art work could be improved in several ways. First off, longer time frame of data is necessary to analyze the full effect of aging to the sales price. The regression model indicates the time variable of year is not significant. This means that ten year time frame is still short to analyze the seasonal effect of time. In addition, longer time range can allow us to isolate the effect of aging of one artist as the artist's career matures in the art world. Secondly, as noted in Michael Shnayerson's book "Boom" (Shnayerson, 2019), the auction only comprise one-third of the total trade in the art world, the remaining being conducted by art dealers and art fairs. The picture of the auction house does not account for the whole of the contemporary art world. However, similar to auction houses, one would expect that the dealer's expertise would play a major role in dictating art sales price. Thus, gathering the data from fairs and individual dealers would paint a better picture of how contemporary art is being traded today.

Reference

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