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Determinants of the Price Paid at Auctions of Contemporary Art for Artworks by Twelve Artists

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Abstract: The use of regression modelling to understand how characteristics of artworks, of artists, and of the circumstances of sale affect the price paid at auction is well-established among cultural economists. Drawing on auction sales data provided by Artprice (accessed on 20 March 2022) I use regression modelling to investigate the determinants of the price paid for artworks by twelve artists at auctions of contemporary art over the period from 1984 to 2019. Each of the artists is modelled separately. For nine of the twelve artists, there was a clear preference among collectors for paintings with specific titles rather than untitled paintings or paintings with generic titles such as ‘abstract’ or ‘composition’. For the other explanatory factors included in the models, my analysis complements and re-contextualizes previous scholarship, showing how collectors’ preferences differed between the contexts examined. Size was a stronger driver of the price paid than in the contexts examined in other studies, and for most artists, collectors were not deterred by the largest artworks. Paintings in oil have continued to appeal to some collectors. Although the number of artists looked at is small, there are some suggestive patterns in how the age of the artist at execution affected the auction price, which might merit further investigation. My models also give some insights into change within the auction market for contemporary art.

Keywords: art auction market; contemporary art; history of art; digital art history; regression modelling; titles



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1. Introduction

The use of linear regression or ‘hedonic’ modelling to give an understanding of the factors which can affect the price paid at auction for works of art is well-established among cultural economists. Hedonic models were so named because they were developed from the economic theory according to which non-standardized goods such as artworks can be modelled as bundles of characteristics, each of which is a source of utility and is valued separately by the consumer.¹ As I will discuss, scholars have used this approach to investigate how characteristics of artworks, of artists, and of the circumstances of the sale have affected the price paid by collectors. Typically, such studies look across the fine art market as a whole or at a particular segment such as that relating to an artistic movement or movements, school, or period.

The approach I have adopted differs from those studies in that I develop separate models for each of the artists included in my analysis. The primary reason for this choice was that I wanted to investigate two artist-specific determinants of the price paid at auction. Firstly, I look at how the artist’s age at the execution of an artwork can affect the price achieved at auction. David Galenson has also investigated this question and is the only scholar amongst those I have surveyed who has also modelled artists separately (Galenson 1997). I also address the question of whether the kind of title an artist’s work was presented with at auction made a difference to collectors. Some of the strongest trends in titling practice in modern and contemporary art have been for artists to present their works as untitled, or to give them short generic titles such as *Abstract*, *Composition*, or *Number 1*.²

For convenience, I will refer to such titles, including ‘untitled’, as ‘generic’. For all the artists I consider, their sales have included a mix of works with such generic titles and what I will call ‘specific’ titles. Joan Mitchell, for instance, did not title many of her paintings and gave others titles that often alluded to a personal memory or emotion associated with a thing or a place she connected with the painting (Nochlin 2002, p. 58). Did collectors value these otherwise comparable works differently?

Using separate models also allowed me to compare and contrast collectors’ preferences with the artists I have investigated, and to consider how price determinants may differ from those in the contexts examined in other studies. Studies which develop a single model for the auction market as a whole or for a particular segment look at averages across that context. As will be seen, modelling artists individually brings out some important differences between the ways in which a particular characteristic can influence the price paid at auction that are masked by those averages. The number of artists I could model was constrained by my wish to explore the influence of the kind of title on the price paid at auction. My results relate to price determinants with those twelve artists. It would, of course, be misleading to draw general conclusions from my analysis. However, as will be seen, there are some suggestive patterns which may merit further investigation through broader studies.

An early application of hedonic modelling to auction sales of paintings was by the economist Robert C. Anderson. In Anderson’s study, the model he developed gave an understanding of the price achieved at auction with 1,500 sales of paintings created from 1690 to 1960 in terms of an underlying rate of appreciation, the size of the painting and a measure of the artist’s repute (Anderson 1974). Since then, cultural economists have used hedonic modelling to look at a range of questions around the influences on the price achieved at auction with sales of works of art.

Amongst studies looking at a particular determinant of auction prices, Alan Beggs and Kathryn Graddy looked at how previous sales of Impressionist, Modern, and Contemporary paintings influence the price paid at auction when a work returns to market (Beggs and Graddy 2009). Drawing on over 430,000 sales at auction from 1980 to 2005, Heinrich W. Ursprung and Christian Wiermann analyzed how an artist’s death influences the market prices for their art (Ursprung and Wiermann 2008). Helen Higgs and Jon Forster investigated the preference amongst purchasers of Australian art for paintings of different sizes (Higgs and Forster 2011). Their dataset was around 52,000 sales of works by 70 Australian artists at Australian auction houses from 1986 to 2009. Drawing on auction sales data for over 65,000 sales of sculptures in 43 different countries from 1985 to 2013, Rustam Vosilov considered the question of whether there was a home bias amongst collectors in the sense that sculptures sold in the artist’s home country commanded a premium compared to those sold in other locations (Vosilov 2015). Looking at around 800 sales from 1955 to 2015, Kim Oosterlinck and Anne-Sophie Radermecker investigated the question of whether art market participants value provisional names (‘The Master of ...’) with paintings by Flemish Old Masters (Oosterlinck and Radermecker 2018). Radermecker has also looked at the question of price determinants in the market for anonymous paintings (Radermecker 2019). Her dataset was 1578 sales of fifteenth- and sixteenth-century anonymous Flemish paintings from 1955 to 2015. David Galenson studied the relationship between the auction value of a painting and the artist’s age at execution drawing on around 4500 auction sales covering the years from 1980 to 1996 of paintings by 42 American or America-based contemporary artists born before 1940 (Galenson 1997). Douglas J. Hodgson conducted an analysis of the age–price relationship with 10,568 auction sales from 1968 to 2010 of paintings by 211 Canadian artists covering the entire history of Canadian art (Hodgson 2011). Elena Stepanova studied the questions of whether the colors used in a painting and the color diversity of a composition can impact the price paid at auction (Stepanova 2015). Her dataset was 127 sales of paintings by Picasso from 1998 to 2016, and 371 sales of paintings by Color Field Abstract Expressionists over the same period. JooYeon Park, Jihye Park and Ji Hyon Park have looked at the impact of different types of titles on

the price achieved at auction with around 1000 sales of paintings in Korea in the period from December 2017 to November 2019 ([Park et al. 2021](#)).

Scholars have also looked at financial returns and price determinants across a range of market sectors, and at the fine art auction market as a whole. Madeleine de la Barre, Sophie Docclo and Victor Ginsburgh used regression modelling to compare the returns on auction sales of Impressionist, Modern, and Contemporary paintings by European artists ([De la Barre et al. 1994](#)). In their study, they drew on auction sales data for 82 artists associated with those movements, covering the years from 1962 to 1992. Richard J. Agnello and Renée K. Pierce studied price determinants including genre effects and financial returns with around 15,000 auction sales of works by 66 American artists from 1971 to 1992 ([Agnello and Pierce 1996](#)). In a similar study, Luc Renneboog and Tom van Houtte looked at sales of paintings by Belgian artists associated with movements from Realism to Surrealism ([Renneboog and Houtte 2002](#)). Their dataset consisted of over 10,500 sales covering the years from 1970 to 1997. Helen Higgs and Andrew Worthington carried out a general investigation of the market for Australian artists, looking at around 37,000 sales of works by 60 Australian artists from 1973 to 2003 ([Higgs and Worthington 2005](#)). Utilizing a dataset of 1.1 million auction sales of works by over 10,000 artists held worldwide from 1957 to 2007, Luc Renneboog and Christophe Spaenjers looked at returns across the fine art market and at a range of characteristics that might influence the price such as the presence of a signature, the subject, and the auction house and location ([Renneboog and Spaenjers 2013](#)). Mathieu Aubry, Roman Kräussl, Gustavo Manso, and Christophe Spaenjers used regression modelling as a benchmark against which to measure the performance of convolutional neural networks in predicting the price of over 1.1 million artworks sold at auction from 2008 to 2015 ([Aubry et al. 2019](#)).

The next section details the criteria used to identify the artists I have modelled and discusses my data sources and the ways in which those data have been cleaned and processed. As the form of the model I have used is a variant of that which is standardly utilized in the literature, this section gives only a summary of the model development process.

I then present the results of my modelling and my reading of those results, considering them in relation to previous scholarship. In summary, for nine of the twelve artists there was a clear preference among collectors for paintings presented at auction with specific titles. The size of the artwork was a stronger driver of the price paid at auction than in the contexts examined in earlier studies, and collectors were not deterred by the largest works of art. Paintings in oil continued to appeal to some collectors and even paintings in oil by artists who consciously challenged art historical traditions such as Martin Kippenberger commanded a premium at auction. Although the number of artists looked at is small, there are some suggestive patterns in how the age of the artist at execution affected the price achieved at auction, which would merit further investigation. For some artists, a painting consigned for sale at Sotheby's and Christie's delivered a premium to sellers, as did sales in what were the two major centers for the contemporary art auction market, New York and London. With some artists, sales in their home country delivered a premium, but for others it did not. We can also see how the activities of the major auction houses, art fairs, dealers, and art museums in promoting and presenting the works of particular artists has driven prices at the top end of the auction market for contemporary art.

My work on collectors' preferences for different types of titles with individual artists is new within cultural economics. In other areas, such as the influence on the sales price of the size of the painting and of the life stage of the artist when executed, my work complements and re-contextualizes previous scholarship.

The author is an art historian whose research investigates the use of quantitative methods and digital resources in the discipline. With traditional art historical methods, it is not possible to develop the kind of disaggregated understanding of collectors' preferences that comes from the use of regression analysis. Although the work of some cultural economists, such as Cynthia White and Harrison White's study of institutional change in the late nineteenth-century French art world, has been influential with art historians,

less attention has been paid to the work of cultural economists who have used hedonic modelling to understand the auction market (White and White 1965). I would hope my research will bring that work to the attention of art historians more widely, alongside my own contribution.

2. Materials and Methods

2.1. Data

To identify artists to model, I searched the auction sales database provided by the auction market information portal Artprice (accessed on 20 March 2022) using a number of criteria relevant to my research questions.³ As I wanted to be able to compare and contrast the results for different artists who have followed similar titling strategies, I restricted my dataset to artists whose works have featured regularly at sales that the major auction houses have advertised as including ‘contemporary’ art. A specific auction market for contemporary art had its beginnings in the United States in the late 1960s and early 1970s (Smith 2009, pp. 117–32; Horowitz 2011, pp. 3–21; Artprice 2020). At that time, Sotheby’s staged sales advertised as being of ‘contemporary’ art once a year in New York. In 1973, it established a contemporary art department, and since then has held contemporary art sales twice a year in New York and London, to be followed by Christie’s in 1974. Originally heavily dominated by New York and then by that city along with London, the auction market for contemporary art has expanded considerably since those early days. Through the 1980s, auction houses in several European countries were holding sales of contemporary art, although the borders between what was sold as contemporary art or as modern or post-war art were quite fluid. With globalization and financial deregulation bringing new collectors into the market from the early 1990s onwards, auction sales of contemporary art were established in several Asian countries. China, in particular, has become a major international location for sales of contemporary art, with a strong domestic market (Artprice 2019).

I searched the Artprice database to identify such artists with a mix of works presented at auction as untitled or having short titles including the words ‘abstract’, ‘number’, or ‘composition’, and works with specific titles.⁴ Different kinds of artwork such as paintings, drawings, or prints by the same artist can be valued very differently in the auction market, and so these artists’ sales were limited to one of either paintings or sculptures, whichever was the most numerous.⁵ As each artist was to be modelled separately and one of the questions to be addressed was that of the impact of the location of the auction on the sales price, the list was reduced further to artists with an international presence in the auction market, including sales in several countries of 200 or more in total, and an average sales price of over \$50,000. In a final step, artists were excluded if all the works with generic or specific titles were executed in a short period of their career or if the thumbnail images of the paintings provided by Artprice suggested that works with different kinds of titles were visually distinct. In those cases, my modelling would have been unable to distinguish between a preference collectors may have had for works with different kinds of titles from works executed at different times of their career, or with certain visual characteristics, respectively. There were also several artists for whom a satisfactory model could not be developed.

Taken together, these criteria led to the twelve artists whose auction sales I have modelled. All have been, and remain, among the top selling artists at auctions of contemporary art. The three born post-war feature regularly in the top 25 of Artprice’s annual list of best-selling ‘contemporary’ (sic) artists (Artprice 2019).⁶ The other nine have sales that would rank them in the top 75, with most in the top 20. They are listed in Table 1.

Table 1. List of Artists.

Artist:	Alexander Calder (1898–1976)	Sam Francis (1923–1994)	Asger Jorn (1914–1973)	Martin Kippenberger (1953–1997)
Nationality:	American	American	Danish	German
Artist:	Joan Mitchell (1925–1992)	Yoshitomo Nara (1959)	Albert Oehlen (1954)	A. R. Penck (1939–2017)
Nationality:	American	Japanese	German	German
Artist:	Sigmar Polke (1941–2010)	Gerhard Richter (1932)	Cy Twombly (1928–2011)	Christopher Wool (1955)
Nationality:	German	German	American	American

For all artists, I collected the sales data given in the Artprice database. For ten of them, this related to sales of their paintings. The exceptions were Alexander Calder and Gerhard Richter. Alexander Calder worked primarily as a sculptor. Calder’s sculptures were works in wire and what he called ‘mobiles’ and ‘stabiles’ (Calder 1966). Mobiles are suspended or standing sculptures that move mechanically or with the flow of air around them, and stabiles are stationary sculptures. Preliminary modelling suggested that the auction market treated each of these types of sculpture separately, and so I restricted my dataset to the most numerous—that of works identified as mobiles. With Gerhard Richter, I restricted the sales data to those of his paintings listed as ‘abstracts’ on his official website.⁷ These make up around half of his oeuvre. The remainder are placed into a number of subject-matter categories on the website, such as candles, clouds, and family. I focused on the abstract paintings as a visually homogeneous group of artworks for which Richter has used a mix of generic and specific titles, and a well-defined body of work that has been the subject of considerable critical and curatorial attention (Godfrey 2012; Mehring 2012; Westheider and Philipp 2020). I wanted to be confident in interpreting my results on collectors’ preferences for paintings with different kinds of titles as indicating that they were responding to the title itself rather than the subject. Although the paintings listed as abstracts go back to 1964, my dataset was also restricted to those created from 1976 as the year in which Richter started to use the title ‘Abstraktes Bild’—a practice scholars have identified as part of a shift in his artistic concerns to include an engagement with abstraction (Storr 2002, pp. 68–69). Richter’s website lists four long series of abstract paintings, with works in each series given the same title. These are the 115 works titled ‘Grün-Blau-Rot’ [Green-Blue-Red] from 1993, the 110 works titled ‘Fuji’ from 1996, the 64 works titled ‘Miniaturen’ [miniatures], also from 1996, and the 64 works titled ‘Schwarz, Rot, Gold’ [Black, Red, Gold] from 1998. Although unique paintings, the works in each series are visually and materially very similar and, as well as appearing in Richter’s Catalogue Raisonné, they also appear in the Catalogue Raisonné of his Editions. Editions typically command a much lower price at auction than unique works of art by the same artist, and so I excluded them from my dataset.

The auction sales data provided by Artprice include the title of the work, the year of its creation, the medium, such as oil or acrylic, the support, such as canvas or board, and its dimensions. The date and location of the sale, the auction house, and the hammer price in local currency and US Dollars, or a flag if the lot was not sold, are also provided. In my dataset, I only included sold lots, and to allow for comparisons across countries and at different times, prices were expressed in real US Dollars—that is, adjusting for inflation.⁸

The period I have investigated was initially determined by the availability of data—the Artprice sales data go back to 1984, and the data I used go through June 2019. This turned out to be a suitable time frame for my analysis. A shorter time frame would have significantly reduced the number of artists I could model as it would have included fewer auction sales. The risk of using a long time frame is that collectors’ preferences may have

changed substantially over that period. However, the results of my modelling indicate that that does not appear to have been the case over the period I have used.

To prepare the auction sales data for modelling, those characteristics that are not numerical were placed into distinct categories. I used three categories for the kind of title the work was presented with at auction. Generic titles were counted as one category and specific titles as another. In some cases, works were presented at auction as untitled with a bracketed sub-title. These may represent the title given to the work by the artist or additions by an owner, dealer, or auction house. Where there were 20 or more such sales, such titles were placed into a separate category as I wanted to see if this approach to titling made a difference with collectors. Otherwise, I combined generic titles and untitled with a bracketed sub-title as one category. As I will discuss in Section 3.2, the results of my modelling give some support to this choice.

In many cases, the Artprice data do not include the support, and so that was not included in the dataset. For the medium, paintings described as being executed in oil, or in oil and other media, were combined as one category, and all other media as another.⁹

In my modelling, I wanted to look both at how the two dominant auction houses—Sotheby's and Christie's—compared to others and also at how the location of the sale might have influenced the price achieved at auction. Sotheby's and Christie's were therefore grouped together as one category and all other auction houses as another. Sotheby's and Christie's accounted for 70% of the sales at the 142 auction houses included in my dataset. The dataset comprises sales at auctions in 22 countries, with sales in the United States and the United Kingdom representing 42% and 27%, respectively, of the total. For each artist, I included the locations with 20 or more sales as separate categories, grouping the remainder together as another. Where the remainder had less than 20 sales, it was combined with the location having the fewest number of sales.

The dimensions of the paintings were combined into one measure of area. As articulated objects, there are no fixed dimensions to a Calder mobile, and for some sales three dimensions were given by the auction house and in others two. I took the longest dimension reported in the data for each sale. Where a definite year of creation was not given in the Artprice data, I took the estimated year or the mid-point of a range of years. For my dataset, the year of creation was converted into the age of the artist at that time. To look at how each artist's prices have changed over time, for each sale the dataset included the number of months of the sale date from December 1983.

Sales where the size of the painting, the medium, or the date of creation were not provided were not included in my dataset. Finally, some sales were excluded from the dataset as part of the model development process, including those where the sales price far exceeded those for other sales by the artist, and some small groups of paintings whose sales prices were consistently over- or under-predicted by my models. The former may represent sales where two or more collectors were bidding aggressively. The latter included, for example, paintings executed by Asger Jorn when he was studying in Paris in the late 1930s, and several works with the same title by Sigmar Polke that online research revealed were misclassified as paintings rather than editions in the Artprice data. Across the twelve artists, my dataset includes a total of 5578 auction sales.

Tables A1 and A2 in Appendix A present descriptive statistics giving, for each artist, the split of their sales in the dataset into each category, and the corresponding average sales prices. What this shows is that, in most cases, works with specific titles sold for much more on average than those with generic titles, although that is reversed for Martin Kippenberger and Cy Twombly. For most artists, sales at Sotheby's or Christie's resulted in substantially higher average sales prices than sales at other auction houses. Auctions in the artist's native country delivered much lower sales prices on average than those in the United States or the United Kingdom. There is no pattern to whether paintings in oil sell for more or less on average than works in other media. However, it would be wrong to conclude that collectors of Kippenberger have placed a premium on generic titles over specific titles or that sales at Sotheby's and Christie's delivered better results for consignors than sales at

another auction house. These factors cannot be considered in isolation as that ignores the relationships between them and with other factors that may determine the price, such as the size of the work, the medium, and the date and location of the sale. The models I have developed give an understanding of how they affect the sales price.

2.2. Regression Modelling

The form of the model developed for each artist is a variant of that standardly used in the literature. It relates the natural logarithm of the price achieved at auction to explanatory variables drawn from the various characteristics included in my dataset.¹⁰ These include dummy variables for the kind of title the work was presented with at auction, the medium, the auction house, and the location of the sale. As I wanted to look at how collectors value paintings produced at different times of an artist's career, the models include the square of the age along with the age at execution. This allows for models where the price of works stays roughly constant, falls with the artist's age at execution, rises with their age, or has a period where the price is at a peak or a trough. In several studies, researchers have looked at whether there is a maximum size that appeals to collectors and beyond which the price paid at auction declines on average, all other factors being equal. This question was investigated by adding the size alongside the natural logarithm of the size, a form for the model which, as with including the artist's age and its square, allows for a size at which prices peak or trough, if there is one to be identified. The other explanatory variable in the model is that of the date of the auction in months from December 1983.

The models include allowances for a boom in the contemporary art market in the late 1980s which affected all the artists modelled with sales during that period. It also allows for persisting downturns in the 1990s for the auction prices with paintings by Sam Francis, Asger Jorn, and A. R. Penck, and for a recent upturn for Penck. For the other nine artists, other than the boom in the late 1990s where relevant, there was consistent underlying growth in their sales prices at auction.

I applied the standard statistical and visual tests for model validity. The statistical tests used were the Durbin Watson test for autocorrelation, the Jarque–Bera and Shapiro tests for normality, and the Breusch–Pagan test for heteroskedasticity. The variance inflation factor test for multi-collinearity of the variables was also used. In the visual tests, the explanatory variables were charted against the standardized residuals. For five of the artists, their model passed all the tests; however, for the others it passed all but the Breusch–Pagan test. Faced with such a model, researchers use a 'heteroskedastic consistent' modified estimation technique robust to that non-constancy, one consequence of which is that there is less confidence in the estimates of the parameters than in standard linear regression. I have used the version of this modified technique, 'HC3', that is recommended in the literature (Long and Ervin 2000). It has been applied to all twelve artists.

Each model is what is called a 'fixed effects' model in that the influence of each characteristic upon the price achieved at auction is assumed to be fixed for the whole of the period of sales being modelled. Although in practice it is likely that collectors' preferences have changed over time, the success of my models in giving predictions that are a good fit to actual auction prices indicates that this is a good approximation for the collectors and artists included in my investigation.

3. Results and Discussion

The full results from my modelling are given in Table A4 in Appendix B. I will now look at each of the explanatory variables in turn, giving my reading of the results and comparing what they say with previous scholarship. For the coefficient associated with each explanatory variable, the regression model gives an estimate of its statistical significance through a *p*-value, or the probability that the observed differences arose by chance. Table A4 reports the *p*-values, with three stars indicating a *p*-value of up to 1%, two stars 1% to 5%, and one star 5% to 10%. In the reading of the results presented in this section, I have focused on those coefficients with *p*-values of 10% or less. In the tables,

variables where the coefficient had a *p*-value of more than 10% have been labelled ‘not sig’, and to create the charts such coefficients have been set to zero. Variables not included in a particular model are labelled ‘n/a’. A comparison of Tables A1 and A4 shows that with categorical variables, the ‘other’ categories are not included in the models for each artist. These categories represent reference points, and the coefficients for the remaining categories can be interpreted in terms of the percentage change in prices for sales in those categories compared to that baseline, all other factors being equal.

3.1. Explanatory Performance

With regression models, the R^2 statistic measures the correlation between the predicted and actual values of the dependent variable. It is interpreted as the proportion of the variation in that variable—in this case, the natural logarithm of the auction price—that can be explained by the model. An R^2 of 1.0 happens when the predicted prices are identical to the actual. A value of 0 indicates that the model is of no value in explaining auction prices. As can be seen from Table 2, my models give an explanation of between 71% and 86% of the variation in the price achieved at auction for all artists bar A. R. Penck. In the literature I have surveyed, regression models of the art market typically have an explanatory performance of around 40%. The much better performance of my models is most likely attributable to the modelling of individual artists. David Galenson ([Galenson 1997](#)), who has modelled individual artists, Douglas Hodgson ([Hodgson 2011](#)) and Mathieu Aubrey, Roman Kräussel, Gustavo Manso, and Christophe Spaeniers ([Aubry et al. 2019](#)), who have artist-specific explanatory factors in their models, have a similar level of explanatory performance to mine.

Table 2. R^2 statistic for the model for each artist.

Calder	Francis	Jorn	Kippenberger	Mitchell	Nara
0.824	0.779	0.710	0.765	0.865	0.798
Oehlen	Penck	Polke	Richter	Twombly	Wool
0.812	0.604	0.705	0.862	0.719	0.725

3.2. Type of Title

In their studies, Renneboog and Spaeniers ([Renneboog and Spaeniers 2013](#)), and Aubry, Kräussel, Manso, and Spaeniers ([Aubry et al. 2019](#)) have developed regression models in which works of art that are untitled or had titles including generic words such as ‘abstract’, ‘portrait’, or ‘landscape’ sold for less at auction, all other things being equal, than works without such words in their titles. However, the base of works of art in both studies is so broad, including paintings, drawings, prints, and editions, and the number of artists so large at over 100,000, that it is not possible to draw any conclusions regarding collectors’ preferences with paintings or sculptures alone, with artists active in a particular period or movement, or with individual artists. Looking at around 1000 sales at auction in Korea over a twelve-month period, Park, Park, and Park find that paintings with an elaborative title commanded a premium compared to those with other types of titles, all other things being equal ([Park et al. 2021](#)). They also find that paintings with a simple descriptive title achieved lower prices than, taken together, those which were untitled or had an elaborative title.

My models are more focused than these other studies and allow us to look at collectors’ preferences for individual artists. The results are presented in Table 3. As can be seen, for nine of the twelve artists, collectors paid more for works presented at auction with specific titles than for comparable works presented with generic titles, all other things being equal. The premiums paid for works with specific titles varied from 12.2% with Alexander Calder’s mobiles to 58.8% with paintings by Yoshitomo Nara. We might account for those preferences in two ways. The critical literature may have been an influence on collectors. In the monographs and exhibition catalogues I have reviewed, paintings with specific titles are usually given disproportionate critical attention compared with works

that are untitled or have generic titles. For instance, in her 2016 *Reading Cy Twombly: Poetry in Paint*, the literary scholar Mary Jacobus often starts a reading by taking her lead from the work's specific title, if it has one (Jacobus 2016). She does not look to interpret Twombly presenting works as untitled. A recent monograph by the art historian Karen Kurczynski on Asger Jorn discusses 52 works with specific titles, compared with four that are untitled (Kurczynski 2014). In comparison, Jorn's Catalogue Raisonné indicates that 32% of his paintings are untitled or have generic titles such as 'Composition' (Atkins 1968–1980). The catalogue for the Sigmar Polke retrospective held at London's Tate Modern in 2008 includes references to 134 paintings by Polke with specific titles and to 37 that are untitled (Halbreich 2014). Over 60% of Polke's paintings sold at auction have been untitled.

Table 3. Percentage change in price for works with specific titles or presented as untitled with a sub-title in brackets, compared to generic titles.

Type of Title	Calder	Francis	Jorn	Kippenberger	Mitchell	Nara
Specific	12.2%	36.8%	21.9%	29.5%	not sig	58.8%
Untitled with bracketed sub-title	n/a	n/a	n/a	not sig	n/a	n/a
Type of title	Oehlen	Penck	Polke	Richter	Twombly	Wool
Specific	24.3%	14.7%	28.1%	not sig	−33.1%	45.1%
Untitled with bracketed sub-title	n/a	n/a	n/a	n/a	not sig	n/a

However, it is unlikely that collectors were influenced by the critical literature to the extent that would result in the substantial premiums paid for works with specific titles. Another potential influence on collectors is the title itself. Compared with a generic title, a specific title more definitively identifies the work, singling it out from other works by the same artist, and contributes more to the meanings it is given. In functioning this way, the specific title would do more to attract potential buyers to the work than a generic title. Some support for this view comes from the literature on the psychology of art reception. In several empirical studies in which participants were asked to rate paintings presented with and without titles, researchers have shown that the inclusion of a meaningful title with a painting can positively affect the viewer's understanding or liking of the artwork (Mullennix and Robinet 2018), and how it is seen (Franklin et al. 1993).

We also need to consider the reasons that collectors of the three other artists did not exhibit such a preference. For Gerhard Richter's abstracts, collectors were indifferent to the type of title it had, paying the same on average and all other factors being equal, for paintings with a generic title and for those with a specific title. In contrast to the other artists, most of Richter's generic titles are 'Abstraktes Bild', whereas with other artists 'Untitled' is by far the most common generic title. Richter's use of 'Abstraktes Bild' as a title can be a key feature of readings, and critics are divided in their opinions of his best abstracts between ones with specific titles and ones with generic titles. The art historian Christine Mehring, for instance, rejects the standard English translation of 'bild' as 'painting' as misguided and leading to misinterpretation (Mehring 2012). Mehring comments that the German term is complicated and that the basic sense it has as 'picture' or 'form of representation' is what Richter seems to have in mind in his remarks in this context. The idea of Richter's abstract works as pictures is central to her interpretation. Mehring also identifies three paintings, all titled *Abstraktes Bild*, as being among his best and most complex abstracts. Specific titles play a more important role in the curator Mark Godfrey's interpretation of Richter's abstracts. In Godfrey's presentation to a 2012 Tate Modern symposium on Richter which accompanied the *Panorama* retrospective, they are seen as singling works out from his ongoing series of abstracts as being his most important works and worthy of special attention (Godfrey 2012). Critical opinions may have influenced collectors of Richter's abstracts to some extent, but it is unlikely to be the complete explanation.

I would speculate that the generic title ‘Abstraktes Bild’ has also taken on a ‘brand’ value in relation to Richter’s abstracts that simply presenting a work as ‘untitled’ does not allow. The term ‘Abstraktes Bild’ is often used not only as the title of a single work by critics but, in the plural, as a name for all his abstract paintings, however they are titled. Collectors have been indifferent between a ‘branded’ Richter abstract and one with a specific title. Modelling Richter separately has allowed me to come to this conclusion and to contrast it with collector’s preferences with other artists. The difference between Richter and other artists in the way in which the kind of title determined the price paid at auction would be masked in studies that looked at averages across the auction market.

Collectors showed no preference between generic and specific titles for Joan Mitchell’s paintings. With Cy Twombly, paintings with specific titles sold for much less than those with generic titles, all other things being equal. None of the explanations I have just offered can account for these preferences. The critical literature is biased towards Mitchell’s and Twombly’s paintings with specific titles. Mitchell’s and Twombly’s paintings with generic titles are predominantly presented at auction as untitled. The paintings of both artists are in high demand, but—if the underlying rates of appreciation in their auction prices that I will discuss are taken as measures of that demand—no more so than the paintings of several of the other artists I have modelled. The supply of paintings by both artists to the auction market as measured by the number of sales is also at a similar level to that of other artists. I remain unable to venture an explanation of the preferences collectors have had for Mitchell’s and Twombly’s paintings with different kinds of titles.

With the two artists, Martin Kippenberger and Cy Twombly, whose sales include significant numbers of paintings presented at auction as untitled with bracketed sub-titles, collectors were indifferent between those works and those presented with generic titles, all other things being equal. This gives some support to my decision to classify paintings presented at auction as untitled with a bracketed sub-title as having generic titles with the other ten artists I have modelled.

My investigation also shows the importance of using regression models to give an understanding of collectors’ preferences. With Martin Kippenberger, paintings with generic titles sold for over two times more, on average, than those with specific titles. However, collectors had a preference, all other things being equal, for the latter. Of two paintings similar in all respects except that one had a generic title and the other a specific title and on sale at the same auction, the expectation is that the latter would sell for more than the former. In my model, there is no one factor that largely accounts for this difference. Rather, Kippenberger paintings presented at auction with generic titles are larger than those with specific titles, are more likely to have been sold at Sotheby’s or Christie’s and in the United States, and are more likely to have been executed in oil. All these factors, as will be discussed, boosted the average price of his paintings with generic titles compared to those with specific titles.

For Gerhard Richter, as shown in Table A2, paintings with specific titles sold for just over twice the price, on average, of those with generic titles. However, collectors were indifferent between Richter abstracts with different kinds of titles, all other things being equal. What accounts for the divergence in average price is mainly the difference in size between paintings with specific titles and those with generic titles. Richter’s paintings with specific titles are 2.2 times the size of those with generic titles on average, and in my model this is associated with a doubling in the price.

3.3. Size of Painting

My models allow a graphical representation of how the size of a painting affected the auction sales price, all other factors being held the same. The results for each artist are presented in Figure 1. The horizontal and vertical axes represent the natural logarithms of the size and the price, respectively. For Alexander Calder, the size is the longest dimension of the mobile. For the other artists, the size is the area of the painting. To interpret the charts, consider the slope of the size–price curve, which gives the ‘size elasticity’ of price, or the

percentage change in the price arising from a 1% change in the size. The vertical position of the curve does not have any interpretive significance. Each chart should also be interpreted as a trend line rather than on a size-by-size basis. To allow for visual comparisons between artists whose sales are of paintings, the size axis runs from the smallest painting sold at auction in my dataset for any of those artists to the largest, and the scale of the price axes are all the same. The size–price curve for each artist runs from the smallest of their artworks sold at auction to the largest.

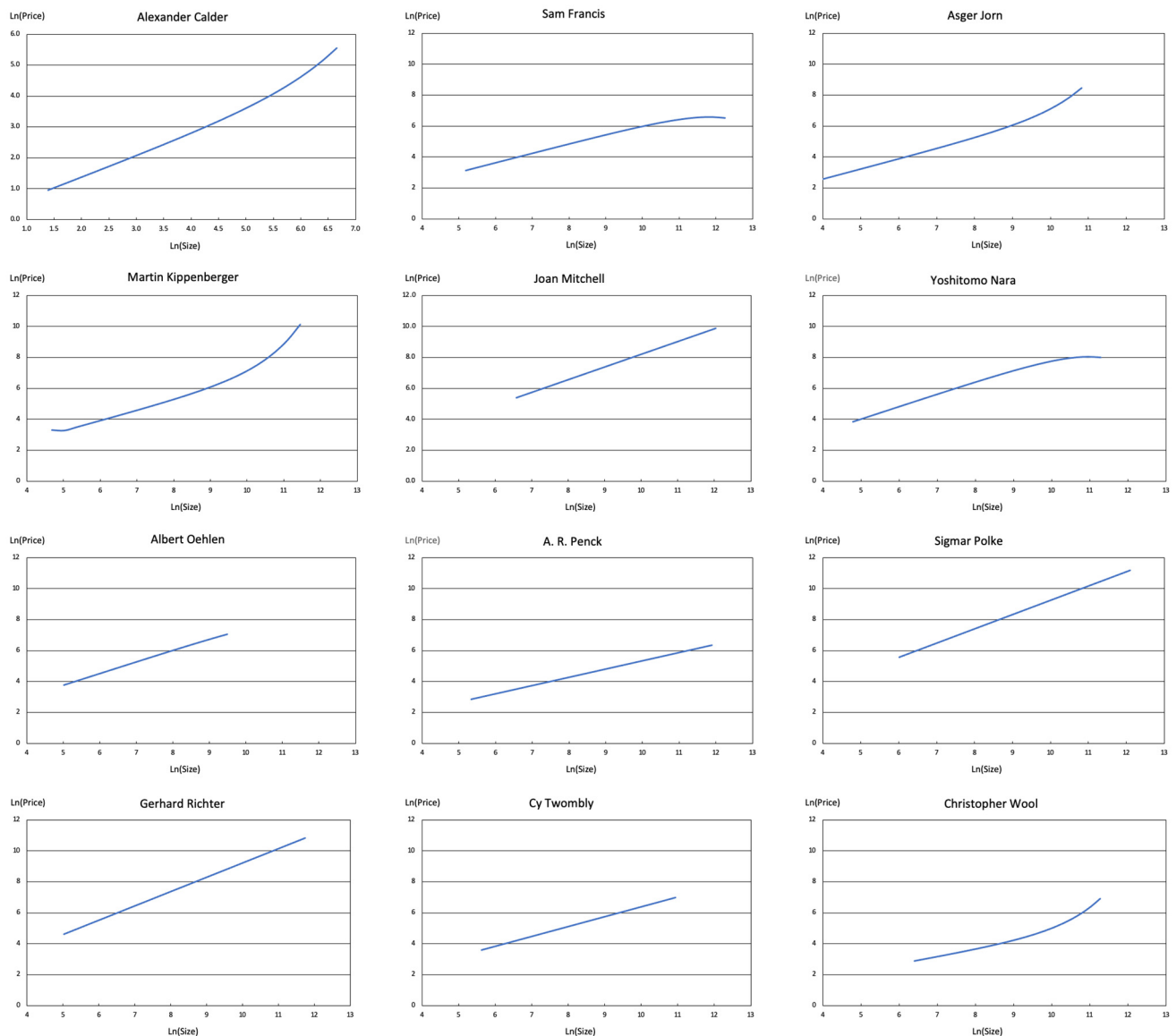


Figure 1. Size-price profiles for each artist.¹¹

As with the contexts examined in many other studies, Figure 1 shows that the size of an artwork was an important determinant of the price achieved at auction. It is a significant factor for all twelve artists. What is also notable with the size–price curves is that the elasticities were constant, or changed little, for all bar the largest works sold. For that range of sizes, a 1% increase in the area of a painting resulted in changes in price from around 0.5% for Christopher Wool to around 0.9% for Sigmar Polke and Gerhard Richter. For Alexander Calder, a 1% increase in the longest dimension of a mobile increased the price paid by around 0.7%. Collectors may consider that the size of a work is a sign of its quality, or may simply be prepared to pay more for a larger painting as it covers more wall space.

As the sociologist Olav Velthuis has discussed in his study of paintings sold by dealers in New York and the Netherlands, the supply side of the market may also be an influence, as it is typically costlier in both time and materials for an artist to produce a larger work than a smaller one (Velthuis 2005). These increased costs may be reflected in the purchase price when the work is first sold, and will subsequently influence the auction price when resold.

Comparing the details of my study with other investigations shows that size was valued more by the collectors of the top end artists in the period I have examined than in the contexts looked at in earlier studies. In David Galenson's models of paintings sold at auctions from 1980 to 1997 by 42 predominantly American or American-based artists born before the Second World War, a 1% increase in the size of a painting led to a price increase of between 0.3% and 0.5% for the majority of artists, all other things being equal (Galenson 1997). Richard Agnello and Renée Pierce have a single model looking at 66 American artists born before World War Two and at auction sales over the period from 1971 to 1992 in which the impact of an increase in size upon the sales price is smaller than in mine (Agnello and Pierce 1996). For a painting of average size, the size elasticity of price is 0.3%, and for the artists I have modelled, it varies from 0.3% to 1.2%. In Renneboog and Spaenjers's analysis of auctions sales from 1957 to 2007 for over 10,000 artists, the size elasticity for an artwork of average size is 0.4% (Renneboog and Spaenjers 2013).

Researchers have found that collectors can be put off by very large paintings, and there is a maximum size beyond which the price paid at auction falls, all other things being equal. In Agnello and Pierce's study, the maximum size is 6.5 square metres (Agnello and Pierce 1996). In their model of auction sales over the period from 1961 to 1990 of paintings by 82 French or Paris-based Impressionist, Modern, and Contemporary artists, and by 82 'Old Masters', de la Barre, Docclo, and Ginsburgh find that there is a maximum size of 5.9 square metres for the former and 1.7 square metres for the latter (De la Barre et al. 1994). In their analysis of 1.1 million sales in the fine art market from 2008 to 2014, Aubrey, Kräussel, Manso, and Spaenjers find a maximum size of 4.9 square meters (Aubrey et al. 2019). The usual explanation given in the economic literature for the presence of a maximum size is that not many private houses have the space to accommodate the largest works sold at auction (Agnello and Pierce 1996; Higgs and Forster 2011).

In strong contrast to those studies, as can be seen from the size profiles in Figure 1, for only two artists, Sam Francis and Yoshitomo Nara, was there a maximum size at which prices peaked within the range of sizes of their paintings sold at auction. For the other ten, there was no maximum size, and, indeed, for four artists the size elasticity of price increased with their largest works sold at auction compared to smaller ones. With the largest paintings sold at auction by Christopher Wool, Martin Kippenberger, and Asger Jorn, and for the largest mobiles sold by Alexander Calder, a 1% increase in size resulted in a price increase of over 1%. We can understand the differences between the results of my modelling and earlier studies as relating to change at the top end of the auction market. In recent years, collectors have become more likely to put works of art purchased at auction into storage, especially if buying high-value paintings for investment purposes (Mason 2017). The number of contemporary art museums has grown substantially in recent decades. In a global survey of private contemporary art museums, Larry's List found that 53% had opened in the years from 2000 to 2010 (Larry's List 2015). Both factors will have boosted the demand for the largest paintings sold at auction. We might also speculate that other collectors active at the top end of the contemporary art auction market over the last thirty years have also had more wall space to fill than those active in the contexts looked at in other studies.

3.4. Medium

According to the traditional hierarchy in the fine arts, oil paintings on canvas were where a painter executed their most important and valuable works. This privileging of oil on canvas persisted within the dominant modernist aesthetic well into the twentieth century, and so it is no surprise that for two of the painters active during the middle decades

of the twentieth century, Sam Francis and Asger Jorn, collectors valued their paintings in oil much more highly than those in other media, all other things being equal. As can be seen from Table 4, for Francis the premium is 69.9% and for Jorn it is 139.6%. Agnello and Pierce find that a premium of 75.1% was given to paintings executed in oil across the artists and auction sales included in their analysis (Agnello and Pierce 1996). In the analysis of Van Renneboog and Spaenjers, a painting executed in oil sold on average for 104% more than a watercolour (Renneboog and Spaenjers 2013).

Table 4. Percentage change in price for paintings in oil compared to other media.¹².

Calder	Francis	Jorn	Kippenberger	Mitchell	Nara
n/a	69.9%	139.6%	116.1%	n/a	26.5%
Oehlen	Penck	Polke	Richter	Twombly	Wool
not sig	22.5%	not sig	n/a	not sig	n/a

From the 1950s onwards, these aesthetic distinctions were increasingly challenged as more artists worked across multiple media and genres, adopted emerging technologies such as film or video, or claimed that what was of artistic value was the idea rather than the execution. Since then, a common critical trope has been to proclaim the ‘death’ or the ‘resurrection’ of painting. Despite these fundamental aesthetic changes, some collectors of artists active in recent decades appear to have persisted in preferring paintings in oil above paintings in other media. In addition to Francis and Jorn, the paintings in oil of three other artists sold for significantly more than works in other media. Works executed in oil by Yoshitomo Nara and A. R. Penck sold for prices 26.5% and 22.5%, respectively, more on average and all other things being equal than paintings in other media. Ironically, for Martin Kippenberger, an artist who challenged and satirized the art historical tradition, collectors have paid more than double for his paintings executed in oil on average than for those in other media, all other factors being equal.

3.5. Auction House and Location of Sale

House can make a substantial difference to sales prices, all other factors being equal.¹³ As can be seen from Table 5, for six artists consigning a work for sale by Christie’s or Sotheby’s delivered a premium to sellers compared with other auction houses. In no case was selling at another auction house of benefit to the seller. With six artists, Table 6 shows that a work consigned in the United States sold for more, on average, than one sold in the locations not included explicitly in their model. For the same group of artists, selling in the United Kingdom delivered a similarly sized premium. Sales in the UK also benefited consignors of paintings by A. R. Penck. For paintings by Asger Jorn and A. R. Penck, sales in the Netherlands and Italy did not give a premium to sellers compared to the locations not included in their models, and for Jorn, sales in France sold for less. With Sam Francis, paintings sold for less in the United States and the United Kingdom than locations not included in his model.

Table 5. Percentage change in price through selling at Sotheby’s or Christie’s compared to other auction houses.

Calder	Francis	Jorn	Kippenberger	Mitchell	Nara
16.5%	32.5%	not sig	41.2%	not sig	not sig
Oehlen	Penck	Polke	Richter	Twombly	Wool
20.8%	not sig	not sig	23.0%	n/a	27.4%

Table 6. Percentage change in price through selling in a location compared to those locations not included in the model.

Location	Calder	Francis	Jorn	Kippenberger	Mitchell	Nara
US	16.4%	−16.4%	n/a	45.6%	not sig	not sig
UK	15.9%	−26.1%	not sig	32.3%	n/a	not sig
France	n/a	not sig	−16.0%	n/a	n/a	n/a
Italy	n/a	n/a	not sig	n/a	n/a	n/a
Netherlands	n/a	n/a	not sig	n/a	n/a	n/a
Hong Kong	n/a	n/a	n/a	n/a	n/a	not sig
China	n/a	n/a	n/a	n/a	n/a	not sig
Home Country (not US)	n/a	n/a	not sig	not sig	n/a	−31.3%
Location	Oehlen	Penck	Polke	Richter	Twombly	Wool
US	44.4%	not sig	104.3%	51.7%	172.2%	not sig
UK	42.2%	36.2%	126.4%	49.0%	147.5%	n/a
France	n/a	n/a	n/a	n/a	n/a	n/a
Italy	n/a	not sig	n/a	n/a	n/a	n/a
Netherlands	n/a	not sig	n/a	n/a	n/a	n/a
Hong Kong	n/a	n/a	n/a	n/a	n/a	n/a
China	n/a	n/a	n/a	n/a	n/a	n/a
Home Country (not US)	n/a	not sig	38.4%	56.0%	n/a	n/a

My models, as other studies, indicate that both the location of the sale and the auction.

Collectors may have considered that being sold by Sotheby's or Christie's was a signal of an artwork of the highest quality. We can also understand the premiums associated to auction house and location as relating to the structure of the high end of the contemporary art market over the years I have examined (Smith 2009, pp. 115–32; Horowitz 2011, pp. 3–21; Artprice 2020). For all the artists bar Yashimoto Nara and Asger Jorn, Sotheby's and Christie's were, and remain, their most important auction marketplaces. Both auction houses have a global presence with offices in New York, London, Paris, and Hong Kong along with other locations. For most of the period of auction sales I have modelled, the most important events have been the contemporary art weeks held in New York and London twice a year, when both Sotheby's and Christie's held day and evening auctions. In recent years, Phillips has also held sales during contemporary art week, and smaller auction houses will also arrange their New York or London sales of contemporary art to tap into this demand. In my model, we can see that the marketing and promotional efforts of the auction houses have paid off. Sales at Christie's and Sotheby's often resulted in higher average sales prices compared with other auction houses, as did auction sales in the United States and the United Kingdom compared with those in other locations. It is also notable that not only have largely the same artists achieved higher sales prices in the United States and the United Kingdom, but the premiums attached to those two locations were very similar, which suggests that for those artists the levels of demand in the two markets have been commensurate. Whether this would hold more broadly for sales at the top end the of contemporary art auction market is a question that might merit further investigation.

My model results for Yoshitomo Nara give a window into how the auction market for contemporary art has been changing. Over the last fifteen years, sales in Asia, in particular of Asian artists, have grown substantially and the auction market for contemporary art in China, including Hong Kong, is on one measure now bigger than that in London (Artprice 2019).¹⁴ Since 2017, there has been a contemporary art week held twice a year in Hong Kong. Sotheby's and Christie's have a smaller market share in Asia than in

their traditional markets, where several Chinese and Hong Kong auction houses have comparable levels of sales. Yoshitomo Nara is one of thirteen Asian artists, mainly Chinese, who were in the top 50 best-selling post-war contemporary artists at auction in 2018/2019 ([Artprice 2019](#)). In my models, sales of paintings by Nara at Sotheby's or Christie's do not command a premium compared with other auction houses, and neither do sales in the United States or the United Kingdom compared with sales in Hong Kong and in mainland China. Looking at other Asian artists would help confirm the strength of this conclusion.

In the economist Rustam Vosilov's regression model for auction sales over the period from 1985 to 2013 of sculptures by 181 artists active from the early nineteenth-century to the present day, there is a clear positive home bias ([Vosilov 2015](#)). Sculptures sold for more on average in the artist's native country than elsewhere, all other things being equal. For artists with an international reputation, Vosilov attributes the domestic premium primarily to the patriotism of some collectors. Vosilov's results cannot be directly compared to mine as he looks at an average across all the artists whose sales he has modelled, at a different group of artists and period of sales, and compares the native country of each artist with all other countries. However, my models suggest that sales of paintings by non-native artists can command a premium in the United States and the United Kingdom, which would indicate that any premium achieved by American or British artists at sales in their native countries should not all be assigned to the patriotism of collectors. They also show that individually the results can be mixed. There was no clear pattern of home bias one way or the other amongst the collectors of the six artists for whom I was able to look at sales in their native country. For Sigmar Polke and Gerhard Richter, sales in Germany boosted prices compared with the locations not included in their models, but with the former to levels significantly lower than for sales in the United States and the United Kingdom. For Yoshitomo Nara, sales in Japan were for lower prices on average than those in the locations not included in his model. Sales of paintings by Asger Jorn, Martin Kippenberger, and A. R. Penck in their home country did not have a significant impact upon the price achieved at auction.

3.6. Rate of Appreciation

The coefficient associated with the variable representing the cumulative month of the sale in my models can be used to calculate an annual percentage change in the price achieved at auction, all other things being equal. The auction market has its ups and downs, and there can be significant fluctuations in the prices achieved at auction for particular artists as they come into and out of fashion. As already discussed, I made adjustments in my models for these factors, and these annual percentage changes can be interpreted as representing the underlying rate of appreciation in real US Dollars of the value at auction of works by each artist. These are presented in Table 7 and, as can be seen, the prices achieved at auction by nine of the twelve artists appreciated considerably over the period I have looked at, increasing by 7% or more per annum on average in real US Dollar terms. Accumulated over the period of sales included in my dataset, these increases are substantial. With Joan Mitchell, for instance, real prices for her paintings increased more than thirty-fold from 1985 to 2019.

Table 7. Annual rates of appreciation in real US Dollar terms for sales by each artist.

Calder	Francis	Jorn	Kippenberger	Mitchell	Nara
9.0%	1.7%	0.7%	7.0%	10.9%	12.2%
Oehlen	Penck	Polke	Richter	Twombly	Wool
15.5%	not sig	9.4%	15.3%	10.7%	20.2%

As with my reading of the results on auction house and location, these results suggest further insights into the top end of the auction market for contemporary art. All these nine artists have been in high demand and have been consistently among the best-selling

artists at auction. All are examples of the ‘virtuous circle’ where the collection, display, and promotional activities of the major auction houses, high-end dealers, art museums, and art fairs work together to drive prices in the contemporary art world (Thompson 2008). The other three artists, Sam Francis, Asger Jorn, and A. R. Penck, for whom the rates of appreciation are substantially lower, have a smaller art world ‘footprint’ than the other nine. Compared with these other artists, their paintings are more likely to appear for sale during an auction house’s daytime sales rather than the more prestigious evening sale. They are less likely to be represented by one of the leading international art dealers. Compared with the other ten artists bar Yashimoto Nara and Albert Oehlen, their art institutional presence in major collections or through retrospectives at major art museums is also lower. A. R. Penck is an artist who has come into and out of fashion more than any of the other artists I have modelled. Prices for his paintings at auction have been volatile, and there has been no underlying change in the real value of his paintings, all other factors being equal.

3.7. Age of Artist at Execution

Of all the characteristics included in my models, this is probably the most difficult to interpret. As will be seen, there are some suggestive patterns in the age profiles across artists. However, although these merit further investigation, that is beyond the scope of this article, and in what follows, I will only offer some speculative comments, particularly where the results relate to those of other scholars. To develop a full explanation would require a detailed study of the biographies of each artist and of the ways in which their artistic careers have been constructed and presented by art historians, critics, curators, and the main auction houses. The inter-relationship between the age of the artist and the historical periods during which they worked would also need to be considered. Some collectors may, for instance, have a preference for works from a movement associated with a particular period rather than for works executed at a particular life stage of an artist involved in that movement. A further complicating factor is that most of the artists were alive for some or all of the period of sales modelled, and so works executed at different ages would have come onto the market at different times during that period. A painting executed early in an artist’s career and brought to market at that time might command a lower price than the same work or a later painting sold once they had an established reputation. Looking at a larger number of artists would also be necessary to confirm the strength of the patterns that can be seen with the twelve modelled.

The age profiles can be spilt into three groups depending upon the life stage of the artist. Each profile shows how the relative price paid at auction changes with the age of the artist at execution, scaled to the price at the youngest age of execution in my dataset. Age-related coefficients that are not statistically significant have been set to zero. The profiles should be interpreted as giving the broad trends in how prices changed with age at execution rather than on a year-by-year basis.

Figure 2 gives the age profiles for Alexander Calder and Asger Jorn, who both died in the decade prior to the start of the period of auction sales I have modelled. As can be seen, with both artists, collectors were indifferent between artworks executed at different points during their careers.

Six of the artists died during the period of auction sales included in my analysis. Their age profiles are given in Figure 3, which shows that collectors of Joan Mitchell and Cy Twombly were indifferent between paintings executed at different stages of their careers. For the other four artists, collectors had a preference for early-career paintings compared with mid-career works. Prices changed little for mid-career works before picking up for paintings executed towards the end of their careers, although for Sigmar Polke this was a modest increase.

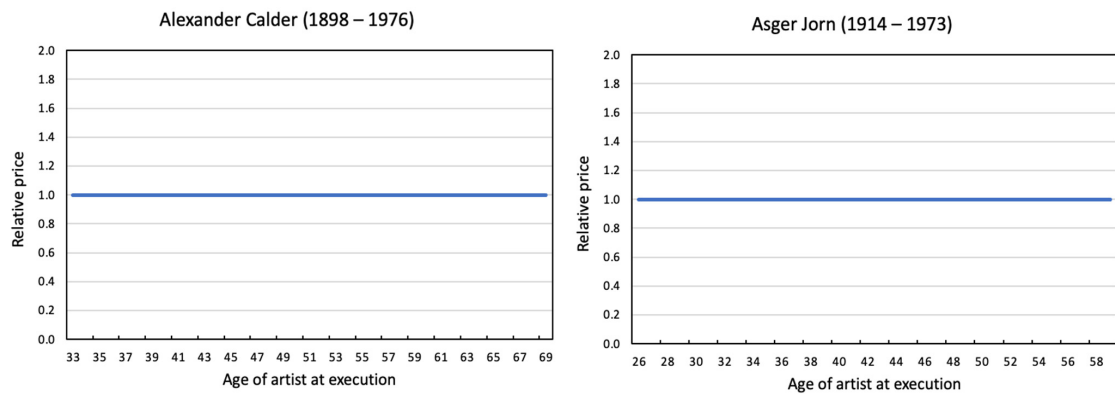


Figure 2. Relative prices for paintings executed at different ages by Alexander Calder and Asger Jorn.

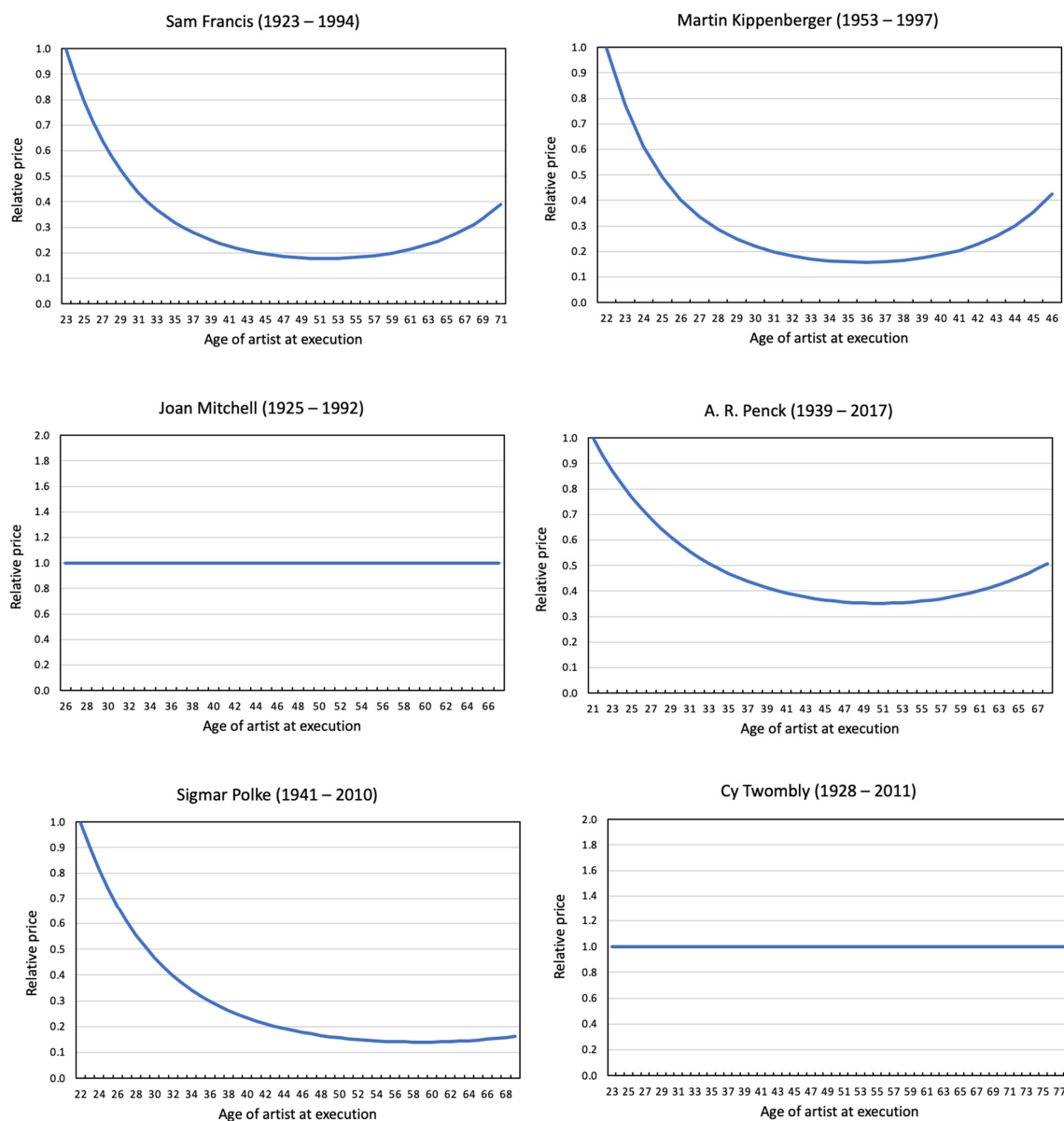


Figure 3. Relative prices for paintings executed at different ages by Sam Francis, Martin Kippenberger, Joan Mitchell, A.R. Penck, Sigmar Polke, and Cy Twombly.

In David Galenson's study of the age profiles for auction sales with 42 American or American-based contemporary artists, the ages at which prices peaked were typically during the years from the late 1940s to the early 1970s, a period when American art has been widely seen as innovative and world-leading ([Galenson 1997](#)). The highest prices paid for paintings by Sam Francis and Sigmar Polke were for paintings executed in the 1950s or 1960s, and suggest that some of the more recent cohort of collectors I have modelled may have continued to value art from the main movements of that time. Sam Francis is often associated with Abstract Expressionism or Tachisme, and Sigmar Polke with a European version of Pop Art.

It is widely believed that auction prices increase once an artist dies, a phenomenon that has been confirmed in the work of cultural economists ([Ursprung and Wiermann 2008](#)). Paintings executed late in an artist's career may therefore first come onto the auction market once collectors have the expectation that they may soon increase in price. These expectations would boost the average price of later works compared with earlier ones. Francis, Penck, and Polke all had lengthy careers and died during the years covered by my auction sales data, and so the pick-up in the average price for their late career works may reflect that factor. Martin Kippenberger died at the premature age of 44, and so a different explanation of his age profile is called for. Paintings executed in the last few years of his life appeared on the market in the late 2000s, by which time his critical and market reputations were established, and so would have been boosted in price compared with mid-career works sold in earlier years. The age profile for Joan Mitchell does not show an upturn for paintings executed towards the end of her career. One possible reason is that Mitchell died in 1992, and the large majority of the auction sales of her paintings have been in the current century.

The remaining four artists—Yoshitomo Nara, Albert Oehlen, Gerhard Richter, and Christopher Wool—were all living at the end of the period of sales I have modelled. Their age profiles are given in Figure 4, and to allow for comparisons between artists have all been presented with the same price scale. As can be seen, relative prices for paintings by Yoshitomo Nara have varied much more with the age at execution than those by the other three artists. What is common to all four is that early works sold on average for less than mid-career paintings, all other factors being equal, and there is a peak age for each artist beyond which prices go into decline. For Nara, Oehlen, and Wool, who are among the youngest artists in my analysis, prices peak for paintings executed in their early 40s.

The price profiles for the artists who were alive at the end of the sales period I have modelled are very different from those of the artists who died before or during it. The pattern of age-profiles given in Figures 2–4 also differs from the age-profiles for artists in the contexts examined by David Galenson ([Galenson 1997](#)) and Douglas Hodgson ([Hodgson 2011](#)). In Galenson's study, there is no correlation between age-profiles and the life stages of the artists. In Hodgson's analysis of 10,568 auction sales over the years from 1968 to 2010 of paintings by 211 Canadian artists covering the entire history of Canadian art, the age profiles all have an inverted u-shape, as with the age profiles shown in Figure 4, and the age at which prices peak tends to decrease the more recently the artist was born. However, developing an understanding of why these profiles have the shape they do, and why they differ from the profiles given in earlier studies is, as I have already mentioned, beyond the scope of this article.

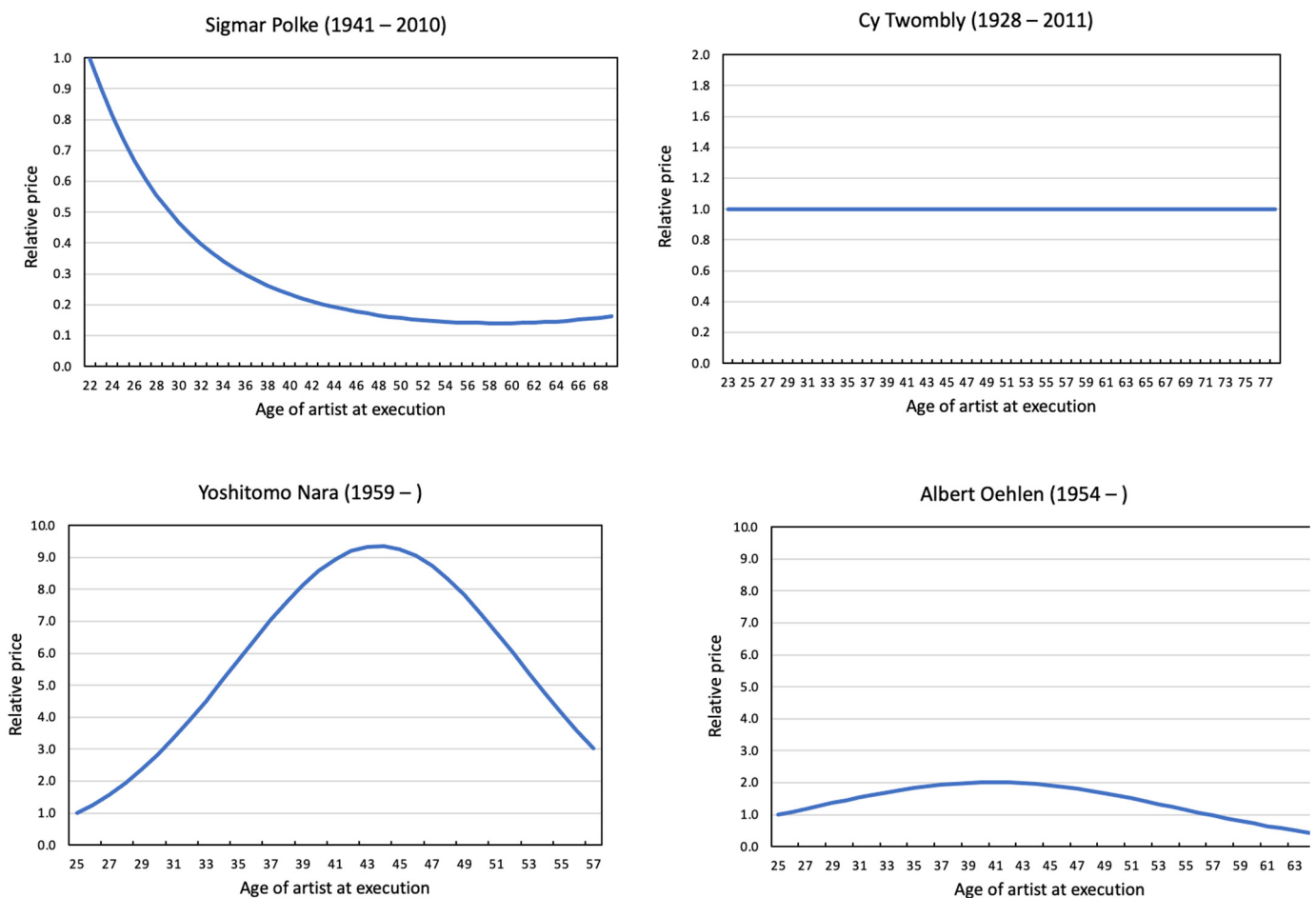


Figure 4. Relative prices for paintings executed at different ages by Yoshitomo Nara, Albert Oehlen, Gerhard Richter, and Christopher Wool.

4. Conclusions

It is of art historical value to have an understanding of what motivates collectors of art and of their preferences between paintings, as it is of how the auction market functions in the increasingly globalized art world of the last few decades. Regression modelling allows for measurable or classifiable factors that might influence collectors or the market more generally to be investigated, and their impact upon the sales price to be determined. I have used this technique to model auction sales for twelve artists. These models give answers to the questions of which characteristics were important to collectors of those artists and of how strongly they valued them. They also give some insights into the operation and change at the top end of the contemporary art auction market.

The approach I have followed is one that is well-established among cultural economists as a way of understanding the art auction market. My work in looking at the preferences of collectors of individual artists for works with different kinds of titles is new in cultural economics. In other areas, my readings complement and re-contextualize earlier studies. We can see how collectors' preferences differ between the context I have looked at and those examined in other studies. They also suggest some potential questions for further research.

In summary, for nine of the twelve artists, there was a clear preference among collectors for paintings presented at auction with specific titles. This was not the case with collectors of Gerhard Richter's abstracts, and I have suggested that these results may show how a title can take on a brand value. It was modelling artists separately that allowed me to come to this conclusion. Any differences between collectors' preferences with Richter's abstracts and with paintings by other artists would be masked in studies which look at the

auction market or at a segment as the object of enquiry. Size was an important driver of the price paid at auction for all twelve artists and, in contrast to the contexts examined in other studies, collectors were not put off by very large paintings. Paintings in oil have continued to appeal to some collectors and even works in oil by artists who consciously challenged art historical traditions, such as Martin Kippenberger, commanded a premium at auction. Although the number of artists I have looked at is small, there are some suggestive patterns in how the age of the artist at execution affected the price achieved at auction, which might merit further investigation. The ‘death effect’, where cultural economists have confirmed the belief that prices rise after the death of an artist, may be seen in my models in an upturn in prices for works executed late in the artist’s career.

For many of the artists I have modelled, consigning a painting for sale by Sotheby’s and Christie’s delivered a premium to sellers, as did selling in what were the two major centers for the contemporary art auction market, New York and London. Not only have largely the same artists achieved higher sales prices in the United States and the United Kingdom, but the premiums attached to those two locations were very similar, which suggests that for those artists the levels of demand in the two markets have been commensurate. My results for Yoshitomo Nara may be indicative of a recent change in the auction market where Asian artists and auctions now account for a substantial share of auction sales of contemporary art. However, research with other artists would be required to confirm these tentative conclusions and whether they hold more generally. For some artists, sales in their home country delivered a premium, but for others it did not. We can also see how rapidly real prices have risen with some artists at the top end of the auction market for contemporary art.

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Appendix A. Descriptive Statistics on Sales Data

This Appendix provides descriptive statistics on the sales data in my dataset. Table A1 shows the number of auction sales in each category included in the model for each artist. Those categories not included are labeled ‘n/a’. For each artist, the locations with 20 or more sales are presented separately, with the remainder grouped together as ‘sale in other country’. Where the remainder had less than 20 sales, it was combined with the location with the fewest sales. Table A2 shows the average price in real US Dollar terms of the sale numbers given in Table A1. Table A3 presents the mean, standard deviation, maximum, and minimum of the numerical variables in my dataset.

Table A1. Auction Sales Numbers.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Number of sales	853	489	868	311
Oil	n/a	144	734	141
Other medium	n/a	345	134	170
Sale at Sotheby’s or Christie’s	797	375	391	182
Sale at another auction house	56	114	477	129

Table A1. Cont.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Sale in the United States	644	294	n/a	69
Sale in the United Kingdom	164	71	222	152
Sale in France	n/a	n/a	49	n/a
Sale in Italy	n/a	n/a	47	n/a
Sale in the Netherlands	n/a	n/a	135	n/a
Sale in Hong Kong	n/a	n/a	n/a	n/a
Sale in China	n/a	n/a	n/a	n/a
Sale in native country (not US)	n/a	n/a	341	63
Sale in other country	45	124	74	27
Generic title	311	330	267	63
Generic title with bracketed subtitle	n/a	n/a	n/a	36
Specific title	542	159	601	210
	Joan Mitchell	Yoshitomo Nara	Albert Oehlen	A. R. Penck
Number of sales	326	483	233	537
Oil	n/a ¹⁵	58	141	144
Other medium	n/a	425	92	393
Sale at Sotheby's or Christie's	289	288	158	258
Sale at another auction house	37	195	75	279
Sale in the United States	264	114	70	66
Sale in the United Kingdom	n/a	55	129	180
Sale in France	n/a	n/a	n/a	n/a
Sale in Italy	n/a	n/a	n/a	32
Sale in the Netherlands	n/a	n/a	n/a	28
Sale in Hong Kong	n/a	148	n/a	n/a
Sale in China	n/a	37	n/a	n/a
Sale in native country (not US)	n/a	100	n/a	166
Sale in other country	62	29	34	65
Generic title	152	105	81	153
Generic title with bracketed subtitle	n/a	n/a	n/a	n/a
Specific title	174	378	152	384
	Sigmar Polke	Gerhard Richter	Cy Twombly	Christopher Wool
Number of sales	412	458	232	364
Oil	34	n/a ¹⁶	102	n/a ¹⁷
Other medium	378	n/a	130	n/a
Sale at Sotheby's or Christie's	306	390	n/a ¹⁸	278
Sale at another auction house	106	68	n/a	86
Sale in the United States	136	191	150	262
Sale in the United Kingdom	188	212	n/a	n/a
Sale in France	n/a	n/a	n/a	n/a

Table A1. *Cont.*

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Sale in Italy	n/a	n/a	n/a	n/a
Sale in the Netherlands	n/a	n/a	n/a	n/a
Sale in Hong Kong	n/a	n/a	n/a	n/a
Sale in China	n/a	n/a	n/a	n/a
Sale in native country (not US)	63	26	n/a	n/a
Sale in other country	25	29	82	102
Generic title	239	381	138	293
Generic title with bracketed subtitle	n/a	n/a	20	n/a
Specific title	173	77	94	71

Table A2. Auction Sales Average Values, real US Dollars.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
All sales	\$969,444	\$387,312	\$99,918	\$439,290
Oil	n/a	\$947,878	\$111,553	\$695,978
Other medium	n/a	\$153,337	\$36,186	\$226,390
Sale at Sotheby's or Christie's	\$976,315	\$461,743	\$107,825	\$617,932
Sale at another auction house	\$871,657	\$142,475	\$93,436	\$187,252
Sale in the United States	\$1,018,565	\$521,982	n/a	\$643,008
Sale in the United Kingdom	\$869,191	\$219,454	\$124,395	\$559,833
Sale in France	n/a	n/a	\$73,478	n/a
Sale in Italy	n/a	n/a	\$80,225	n/a
Sale in the Netherlands	n/a	n/a	\$86,623	n/a
Sale in Hong Kong	n/a	n/a	n/a	n/a
Sale in China	n/a	n/a	n/a	n/a
Sale in native country (not US)	n/a	n/a	\$100,233	\$47,640
Sale in other country	\$631,837	\$164,128	\$81,125	\$153,914
Generic title	\$745,067	\$178,264	\$56,565	\$469,845
Generic title with bracketed subtitle	n/a	n/a	n/a	\$1,260,387
Specific title	\$1,098,192	\$821,187	\$119,178	\$289,073
	Joan Mitchell	Yoshitomo Nara	Albert Oehlen	A. R. Penck
All sales	\$1,400,519	\$324,640	\$457,214	\$54,439
Oil	n/a	\$221,139	\$483,122	\$68,525
Other medium	n/a	\$338,765	\$417,507	\$49,278
Sale at Sotheby's or Christie's	\$1,459,793	\$417,334	\$561,366	\$72,628
Sale at another auction house	\$937,452	\$187,739	\$237,799	\$37,620
Sale in the United States	\$1,452,888	\$332,650	\$430,298	\$73,074
Sale in the United Kingdom	n/a	\$303,981	\$575,070	\$76,560
Sale in France	n/a	n/a	n/a	n/a
Sale in Italy	n/a	n/a	n/a	\$33,364
Sale in the Netherlands	n/a	n/a	n/a	\$72,269
Sale in Hong Kong	n/a	\$573,967	n/a	n/a
Sale in China	n/a	\$226,949	n/a	n/a

Table A2. Cont.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
	Sigmar Polke	Gerhard Richter	Cy Twombly	Christopher Wool
Sale in native country (not US)	n/a	\$56,131	n/a	\$31,057
Sale in other country	\$1,117,528	\$110,448	\$65,469	\$36,669
Generic title	\$1,018,942	\$130,621	\$416,512	\$43,178
Generic title with bracketed subtitle	n/a	n/a	n/a	n/a
Specific title	\$1,733,851	\$378,535	\$478,903	\$58,926
All sales	\$721,184	\$2,747,043	\$3,752,253	\$1,490,854
Oil	\$517,753	n/a	\$2,094,308	n/a
Other medium	\$739,482	n/a	\$5,053,102	n/a
Sale at Sotheby's or Christie's	\$910,316	\$3,057,826	n/a	\$1,698,828
Sale at another auction house	\$175,199	\$964,610	n/a	\$818,567
Sale in the United States	\$854,405	\$3,817,282	\$4,696,690	\$1,503,931
Sale in the United Kingdom	\$887,531	\$2,309,526	n/a	n/a
Sale in France	n/a	n/a	n/a	n/a
Sale in Italy	n/a	n/a	n/a	n/a
Sale in the Netherlands	n/a	n/a	n/a	n/a
Sale in Hong Kong	n/a	n/a	n/a	n/a
Sale in China	n/a	n/a	n/a	n/a
Sale in native country (not US)	\$114,049	\$298,474	n/a	n/a
Sale in other country	\$275,511	\$1,091,889	\$2,024,622	\$1,457,266
Generic title	\$354,047	\$2,365,214	\$3,537,800	\$1,338,854
Generic title with bracketed subtitle	n/a	n/a	\$10,619,591	n/a
Specific title	\$1,228,385	\$4,636,350	\$2,560,324	\$2,118,125

Table A3. Descriptive statistics for numerical variables¹⁹.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Real price:				
Mean	\$969,444	\$387,312	\$99,918	\$439,290
Standard deviation	(\$1,314,641)	(\$803,063)	(\$127,566)	(\$1,117,812)
Maximum	\$10,253,968	\$6,574,452	\$1,338,200	\$11,848,249
Minimum	\$9987	\$3653	\$2267	\$1682
Size:				
Mean	117	18,758	4663	14,538
Standard deviation	(96)	(25,056)	(4855)	(17,203)
Maximum	777	209,000	50,301	93,183
Minimum	4	180	54	108
	Joan Mitchell	Yoshitomo Nara	Albert Oehlen	A. R. Penck
Real price:				
Mean	\$1,400,519	\$324,640	\$457,214	\$54,439
Standard deviation	(\$2,137,487)	(\$522,930)	(\$702,689)	(\$65,412)
Maximum	\$14,759,583	\$3,701,134	\$6,419,070	\$524,677
Minimum	\$6983	\$2360	\$3051	\$3575
Size:				
Mean	25,446	8217	38,097	17,624
Standard deviation	(25,453)	(11,811)	(23,430)	(20,438)
Maximum	168,534	80,155	131,130	145,000
Minimum	720	120	154	208
	Sigmar Polke	Gerhard Richter	Cy Twombly	Christopher Wool
Real price:				
Mean	\$721,184	\$2,747,043	\$3,752,253	\$1,490,854
Standard deviation	(\$1,886,358)	(\$5,634,997)	(\$8,874,366)	(\$3,312,582)
Maximum	\$25,850,726	\$44,897,321	\$67,722,441	\$28,543,510
Minimum	\$4263	\$10,519	\$17,665	\$2396
Size:				
Mean	18,779	17,196	16,699	24,762
Standard deviation	(20,678)	(21,930)	(17,425)	(17,613)
Maximum	180,000	126,266	160,550	78,111
Minimum	411	151	345	599

Appendix B. Regression Modelling Results

Table A4 presents the results of the regression modelling. For each artist, the estimates of the coefficients in their model are presented, along with their standard deviations in brackets and their *p*-values in the asterisks following the coefficient value. Three asterisks (***) indicate a *p*-value of up to 1%, two asterisks (**) a *p*-value of 1% to 5%, and one asterisk (*) a *p*-value of 5% to 10%. 'N/a' indicates that the variable is not included in the model for that artist. The market dummy is a variable that corrects for the boom in the contemporary art market in 1988 and 1989. The artist-specific dummies correct for subsequent upturns and downturns for individual artists. 'Inc.' indicates that a dummy variable is included in the model. The final row gives the R^2 statistic, or the correlation between the estimated and actual values of the natural logarithm of the price.

Table A4. Results from Regression Modelling.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Constant	8.6766 *** (0.646)	11.2378 *** (0.840)	5.0770 *** (0.618)	13.6768 *** (2.070)
Logarithm of Size	0.6821 *** (0.044)	0.6072 *** (0.036)	0.6603 *** (0.040)	0.7029 *** (0.085)
Size	0.0013 *** (0.0004)	−0.0000044 * (0.0000025)	0.000028 *** (0.000008)	0.0000214 *** (0.000007)
Oil	n/a	0.5245 *** (0.107)	0.8736 *** (0.064)	0.7706 *** (0.110)
Sale at Sotheby's or Christie's	0.1526 ** (0.071)	0.2812 *** (0.091)	0.0897 (0.090)	0.3451 ** (0.145)
Sale in the United States	0.1515 * (0.087)	−0.1786 * (0.101)	n/a	0.3756 * (0.202)
Sale in the United Kingdom	0.1471 (0.093)	−0.3021 ** (0.117)	0.0229 (0.106)	0.2802 (0.191)
Sale in France	n/a	−0.0922 (0.110)	n/a	n/a
Sale in Italy	n/a	n/a	0.1390 (0.109)	n/a
Sale in the Netherlands	n/a	n/a	−0.0346 (0.105)	n/a
Sale in Hong Kong	n/a	n/a	n/a	n/a
Sale in China	n/a	n/a	n/a	n/a
Sale in native country	n/a	n/a	0.0457 (0.080)	0.2308 (0.208)
Auction date, month	0.0072 *** (0.0002)	0.0014 *** (0.003)	0.0006 ** (0.0002)	0.0056 *** (0.001)
Specific title	0.1149 *** (0.036)	0.3135 *** (0.074)	0.1977 *** (0.050)	0.2548 ** (0.127)
Generic title with subtitle in brackets	n/a	n/a	n/a	0.2041 (0.215)
Artist's age at execution of work	−0.0277 (−0.020)	−0.2175 *** (0.028)	−0.0359 (0.025)	−0.6883 *** (0.121)
Artist's age squared	0.000039 (−0.00017)	0.0020 *** (0.0003)	0.0005 (0.0004)	0.0096 *** (0.002)
Market dummy	inc.	inc.	inc.	n/a
Artist-specific dummy	n/a	inc.	inc.	n/a
R^2	0.824	0.779	0.710	0.776
	Joan Mitchell	Yoshitomo Nara	Albert Oehlen	A. R. Penck
Constant	1.8675 ** (0.793)	−10.9991 *** (1.340)	−5.1928 *** (1.286)	7.9502 *** (0.845)
Logarithm of Size	0.8223 *** (0.062)	0.8058 *** (0.038)	0.7451 *** (0.065)	0.5371 *** (0.055)
Size	−0.000044 (0.000034)	−0.000014 *** (0.000004)	−0.0000081 *** (0.0000027)	0.0000012 (0.0000027)

Table A4. Cont.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Oil	n/a	0.2348 ** (0.091)	0.0820 (0.102)	0.2030 *** (0.070)
Sale at Sotheby's or Christie's	0.1177 (0.120)	0.0869 (0.090)	0.1893 * (0.102)	0.0424 (0.136)
Sale in the United States	−0.1598 (0.134)	−0.0728 (0.153)	0.3671 ** (0.153)	0.1239 (0.178)
Sale in the United Kingdom	n/a	−0.0421 (0.164)	0.3517 ** (0.154)	0.3086 ** (0.154)
Sale in France	−0.2380 (0.164)	n/a	n/a	n/a
Sale in Italy	n/a	n/a		0.2031 (0.141)
Sale in the Netherlands	n/a	n/a		0.2594 0.204
Sale in Hong Kong	n/a	0.1002 (0.164)	n/a	n/a
Sale in China	n/a	0.0194 (0.182)		n/a
Sale in native country	n/a	−0.3755 ** (0.157)	n/a	−0.0836 (0.088)
Auction date, month	0.0097 *** (0.0003)	0.0096 *** (0.001)	0.0120 ** (0.001)	0.0002 (0.0005)
Specific title	−0.0289 (0.079)	0.4627 *** (0.080)	0.2172 ** (0.105)	0.1371 ** (0.063)
Generic title with subtitle in brackets	n/a	n/a	n/a	n/a
Artist's age at execution of work	0.0173 (0.0026)	0.5495 *** (0.064)	0.2287 *** (0.056)	−0.1180 *** (0.026)
Artist's age squared	−0.0003 (0.0002)	−0.0062 *** (0.001)	−0.0028 *** (0.0007)	0.0011 *** (0.0003)
Market dummy	inc.	n/a	inc.	inc.
Artist-specific dummy	n/a	n/a	n/a	inc.
R ²	0.865	0.798	0.812	0.604
	Sigmar Polke	Gerhard Richter	Cy Twombly	Christopher Wool
Constant	4.6865 *** (0.909)	1.0582 (1.916)	4.3797 ** (1.701)	−11.4618 *** (2.909)
Log of Size	0.9250 *** (0.067)	0.9233 *** (0.048)	0.6386 *** (0.173)	0.4476 *** (0.126)
Size	−0.0000032 (0.0000028)	−0.000003 (0.000003)	0.000014 (0.000013)	0.0000241 *** (0.000007)
Oil	−0.0581 (0.148)	n/a	−0.1123 (0.133)	n/a
Sale at Sotheby's or Christie's	0.1314 (0.159)	0.2072 ** (0.103)	n/a	0.2418 ** (0.122)
Sale in the United States	0.7140 *** (0.200)	0.4170 *** (0.147)	1.0012 *** (0.299)	0.0828 (0.126)
Sale in the United Kingdom	0.8170 *** (0.203)	0.3989 *** (0.146)	0.9064 *** (0.300)	n/a
Sale in France	n/a	n/a	n/a	n/a
Sale in Italy	n/a	n/a	n/a	n/a
Sale in the Netherlands	n/a	n/a	n/a	n/a
Sale in Hong Kong	n/a	n/a	n/a	n/a
Sale in China	n/a	n/a	n/a	n/a
Sale in native country	0.3243 (0.200)	0.4449 ** (0.209)	n/a	n/a
Auction date, month	0.0075 *** (0.0005)	0.0119 *** (0.0003)	0.0085 *** (0.001)	0.0153 *** (0.001)
Specific title	0.2485 *** (0.092)	0.0692 (0.087)	−0.4015 *** (0.127)	0.3725 *** (0.143)

Table A4. Cont.

	Alexander Calder	Sam Francis	Asger Jorn	Martin Kippenberger
Generic title with subtitle in brackets	n/a	n/a	0.0142 (0.250)	
Artist's age at execution of work	−0.1706 *** (0.029)	0.1541 ** (0.069)	−0.0077 (0.045)	0.6480 *** (0.139)
Artist's age squared	0.0014 *** (0.0003)	−0.0012 ** (0.001)	−0.00007 (0.0004)	−0.0080 *** (0.002)
Market dummy	inc.	inc.	inc.	n/a
Artist-specific dummy	n/a	n/a	n/a	n/a
R squared	0.705	0.862	0.719	0.725

***: *p*-value of up to 1%. **: *p*-value of 1–5%. *: *p*-value of 5–10%.

Notes

- ¹ For an introduction to hedonic modelling see [Sopranzetti \(2014\)](#).
- ² The many ways in which artists have used such titles is one of the themes traced out by John Welchman in his history of titles in the Western visual arts tradition ([Welchman 1997](#)). For a quantitative art historical analysis see [Bowman \(2022\)](#) (accessed on 20 March 2022).
- ³ The Artprice database can be found at <https://Artprice.com> (accessed on 20 March 2022).
- ⁴ The Artprice database allows the user to search by the title of the work and automatically translates all searches in English into Chinese, French, German, Italian, and Spanish.
- ⁵ In doing this I have relied upon the categorisation given by Artprice, which groups works into sculptures, paintings, drawings, and prints or editions.
- ⁶ Artprice defines a 'contemporary' artist as someone born after 1945.
- ⁷ Gerhard Richter's official website can be found at <http://www.gerhardrichter.com/> (accessed on 20 March 2022).
- ⁸ June 2019, the most recent month for which auction sales data was obtained, is the reference month. Prices have been adjusted using the CPI.
- ⁹ Examination of the Artprice data showed that in some instances the same work was reported as being in oil by one auction house and in unspecified 'mixed media' by another. To the extent that collectors were influenced by the description of the medium rather than that of the painting itself, this will have affected my modelling results, tending to reduce the size and significance of any impact on the sales price of a painting being in oil compared to other media.
- ¹⁰ My models include the natural logarithms of the price and size. These transformations improve the model fit as the distributions of price and size for all of the artists are skewed with small numbers of very high price and very large artworks.
- ¹¹ For Joan Mitchell, A. R. Penck, Sigmar Polke, Gerhard Richter and Cy Twombly the coefficient of size was not statistically significant and has been set to zero.
- ¹² All of the paintings in my dataset by Joan Mitchell and by Gerhard Richter were executed in oil, whereas only two of Christopher Wool's are recorded as having been executed in oil.
- ¹³ As a result of the different ways in which auction houses and locations are categorised it is not possible to make a quantitative comparison between my results and other studies, nor between those studies themselves.
- ¹⁴ Artprice excludes works by artists born pre-war such as Alexander Calder, Gerhard Richter and Cy Twombly whose auction sales remain concentrated in the United States and Europe. If these artists are included, sales of contemporary art in London continue to exceed those in China.
- ¹⁵ All of Joan Mitchell's sales were for paintings executed in oil.
- ¹⁶ 456 of Gerhard Richter's sales were of paintings executed in oil.
- ¹⁷ 362 of Christopher Wool's sales were of paintings not executed in oil.
- ¹⁸ 213 of Cy Twombly's sales were at auctions held by Sotheby's or Christie's.
- ¹⁹ For Alexander Calder the size is in cm, for all other artists the size is in cm².

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