

# **The value of experience: evidence from art auctions**

## **Abstract**

Art has long been considered an “investment of passion” that not only offers aesthetic utility but the potential of economic benefit. Only recently, however, art has been viewed through the lens of modern portfolio theory and thus, looked at as a potential alternative investment. Indeed the art market opaqueness makes investing in art a highly risky strategy. In this paper we analyse the informative value of pre-sale price estimates provided by auction houses with different degrees of experience regarding the artwork. We use a unique data base of repeated art auctions to examine presale price estimates when the auctioneer has different degrees of information about an artwork. We find that pre-sale estimates tend to overestimate the value of an artwork when paintings are placed in an auction for the first time, and these paintings fetch higher prices if sold. On the other hand, presale estimates for the same painting are lower, estimates are more precise, and paintings are more likely to be sold when the auctioneer has previous experience dealing with the artwork. Our evidence contributes to the art market transparency. It also improves market intelligence in highlighting the extent to which estimates can serve as reference points for art valuation and drive operators’ investment strategy.

**JEL Classification:** D44, G11, G23, Z11

**Keywords:** Alternative Investments, Art investments, Auctions, Pre-sales estimates.

## 1. Introduction

As an effect of the 2008 financial crisis and the current economic uncertainty, a growing component of investors has moved from traditional financial assets to alternative investments, including art. HNWI's from emerging markets seem to be a powerful force behind the so called "Investments of Passion", i.e. a wide array of alternative assets including jewelry, diamonds, wine, and art (Capgemini-RBC 2013). Among these, especially art is seen as a solid investment which is likely to appreciate in value over time and/or offer a low correlation to mainstream financial instruments (JP Morgan 2012; Mei and Moses 2011).<sup>1</sup>

Global art sales have experienced an extraordinary growth over the last decade, doubling in size since 2002 (from 22 to 43 billion euros in 2012. TEFAF 2013). This remarkable development has resulted in the "financialisation" of the art market and the appearance of an *Art&Finance community* (Deloitte-ArtTactic 2013) promoting art as a new asset class and offering a wide range of financial products related to art (from art lending to art investment servicing). New types of Art&Finance services have also appeared to the market, including on-line artworks evaluation (Tutela Capital) and auditing (Deloitte Art and Finance) pertaining to art funds. Looking at the wealth management industry, the growth in buying interest for art has led to the creation of numerous specialized funds. The global art investment fund market is estimated to be worth USD 1.62 billion in 2012, up by over 60% since 2011, corresponding to more the 80 funds (Deloitte-ArtTactic 2013).<sup>2</sup>

One of the most striking issues the Art&Finance community has been facing so far is the reconciliation of financial approaches within a context where intangible factors are common. The stronger presence in the international financial market of vehicles investing

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<sup>1</sup> A study by JPMorgan suggests that art may add diversification benefits within the context of an investment portfolio. Precisely the analysis shows that over the last 25 years, art (as measured by the Mei Moses World Art Index) had almost zero correlation with U.S. equities, and was negatively correlated with fixed income and REITs. In the same vein, according to the 2011 Capgemini-RBC Global Wealth Management Financial Advisor Survey, 42% of advisors believe their HNWI clients invest in art primarily for its potential to gain in value.

<sup>2</sup> In 2012 an estimated 83 art funds were in operation, 58 of which have been set up in China since 2009. Also, existing art funds have increased asset under management, as the Fine Art Fund Group which currently has USD 200 million under management, up by more than 60% since November 2011.

in art has stimulated a call for greater transparency in the art market. The Alternative Investment Fund Managers Directive (AIFMD) goes toward this direction, in that it promotes a standardized and more transparent framework for all alternative investments, including those related to art.<sup>3</sup>

Indeed assessing art is complex as each artwork is unique and either subjective or objective components concur to determine its value. Consistently, investing in art is a highly risky strategy due to the opaqueness, illiquidity, price volatility, and high transaction costs of the market (Baumol 1986). In such a context, each piece of reliable information is extremely valuable.

Historically, a fundamental source of information for art market participants has been represented by auction houses' pre-sale estimates.<sup>4</sup> According to Sotheby's an auction estimate is "a price that the auction house's specialists believe a piece might bring at auction". Since the price of each artwork is normally affected by inconstant and intangible factors (that is time, tastes, place and random elements), estimates are usually expressed as a range within which the experts forecast the final price will fall.<sup>5</sup>

From investors' point of view, it is crucial to understand reliability and predictability power of pre-sale estimates. In principle, auctioneers seem to be in the best position to set the most accurate and truthful estimate of the expected hammer price as possible, as "honesty is the best policy" (Milgrom and Weber 1982). In practice, it is not uncommon for estimates being biased and thus, for artworks being either underestimated (when lots are sold at a price greater than the upper bound) or overestimated (when lots are either sold at a price below the lower bound of the range or "bought-in", i.e. unsold).<sup>6</sup>

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<sup>3</sup> The European Commission Directive on Alternative Investment Fund Managers (AIFMs) has the objective to create a comprehensive and effective regulatory and supervisory framework for AIFMs at the European level. It introduces harmonised requirements for entities engaged in the management and administration of alternative investment funds (AIF) addressed to professional investors in the EU. It covers a large variety of alternative investment funds and their managers, including funds investing in illiquid assets as real estate, private equity, commodities or goods like wine or art. The Directive scope ranges from, among others, capital requirements, risk and liquidity management, to rules regarding disclosure to investors and reporting to competent authorities. It will apply from 22 July 2013.

<sup>4</sup> Sotheby's and Christies started publishing pre-sale estimates in the mid Seventies with the purpose of attracting individual investors by "leveling the playing field" between the experienced wholesale market participants and uninformed retail customers (Mei and Moses 2005).

<sup>5</sup> According to Beggs and Graddy (2009) auctioneers' aim is that the actual price falls in the middle of the low and high estimate.

<sup>6</sup> See Sproule and Valsan (2007) for a detailed review of the biasedness issue in the art auction literature.

In this paper we analyze the informative value of pre-sale price estimates provided by auction houses with different degrees of experience regarding the artwork.

We define “experienced” auctioneers as those who have knowledge of the market dynamics for a given artwork by a given artist, deriving from having already auctioned that artwork (or a different artwork by the same artist) several times over the sample period. If estimates summarize all the relevant information (Candela et al. 2004), more experienced auctioneers should be able to set more accurate estimates, relative to less experienced auction houses. Therefore, pre-sale estimates set by experienced auction houses may contribute to alleviate market inefficiencies (Baumol 1986), e.g. by increasing transparency and liquidity in the art market.

Our work contributes to the existing literature on art auctions in several ways. It first introduces a definition of “experience” and compares experienced with inexperienced auction houses in order to assess whether the former produce more accurate estimates than the latter. Furthermore, it focuses on whether auction houses, in setting pre-sales estimates, may incorporate *private* information while previous contributions focus on the degree to which the estimates incorporate *public* information (i.e. information observable by all market participants and mainly displayed in auctioneers’ catalogues). It also makes a further, although, indirect attempt in shedding light on art demand’s characteristics. As one may expect, characteristics and behaviour of buyers are significant drivers of art prices (Mandel 2009; Sproule and Valsan 2006). However it is extremely difficult to quantify bidders’ behaviour, as different buyers vary in purchase motives, information set regarding an auction, as well as of course their willingness and ability to pay.<sup>7</sup>

Our work also has relevant implications for the Art&Finance community. Our results can contribute to the art market transparency in providing investors with a further criterion to assess the quality of information available in the market. In this regard, our

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<sup>7</sup> Sproule and Valsan (2006) state that “each buyer walks into the auction with a unique blend of aesthetic credo, investment knowledge, wealth, and even prejudice ... This aspect is conspicuous by its absence from the research on art markets, and it is not difficult to guess why”. In an attempt to provide insights into art purchasers’ habits, Pommerhene and Feld (1997) argue that public museums tend to overpay because they target works whose calibre and historical relevance are not in question. More recently Goetzmann et al. (2011) shed light on wealthy collectors’ ability to purchase art, by analysing the evolution of top incomes over time, especially if the highest incomes also go to the wealthiest individuals.

findings help understand the extent to which pre-sale estimates can serve as reference points for the art valuation process and ultimately drive operators' investment strategy.

There are several reasons why an experienced auctioneer would have more insights into the pricing of a particular artwork than an auctioneer without previous experience. First of all, auctioneers in general have more information about the supply side of an artwork: they usually gather with the seller before the auction, so they know their identity and are likely to learn the reasons why the seller wishes to place the painting in an auction. More importantly, auctioneers are privately informed, and very secretive, about the reserve price set by the seller (Ashenfelter 1989; Mei and Moses 2005).<sup>8</sup> The knowledge of the reserve price in the previous auction allows auctioneers to have insights as to, for example, whether the painting was unsold because of a too high reserve price, or on the contrary, whether it was sold due to an exceptionally low reserve price.

Moreover, experienced auction houses have insights on the demand side of the market. For example they know the identity and bids of all interested buyers, including those placing bids through the phone or electronically, and not only buyers physically present at the auction venue. Therefore they know whether bids are authentic or fictitious "off-the-wall" bids placed on behalf of the seller (see Ashenfelter 1989). Importantly, they may be informed about who is in the market for a particular artist's work in a specific phase of the market. This occurs because auction houses hold close ties to their most important clients and have therefore knowledge of their preferences and possible behaviour at auctions (Sproule and Valsan 2006).<sup>9</sup>

Our main hypothesis is that a valuable portion of auctioneers' experience derives from their knowledge of market participants and dynamics on both the buy and sale side (e.g. collectors' preferences, holdings, and expenditure capacity, as well as sellers' expectations and financial needs). It is worth stressing out that, in our view, experienced

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<sup>8</sup> As reported by Sotheby's in its glossary "never formally disclosed, the reserve price is the confidential minimum price agreed upon between the consignor and Sotheby's. Reserves must be set at or below the low estimate, and if bidding ends before the reserve is reached, the property will not be sold". While unknown, it is commonly acknowledged that the reserve price is set at about 70% of the low estimate (Ashenfelter and Graddy 2011; McAndrew and Thompson 2007).

<sup>9</sup> Candela et al. (2004) for example observe that most collectors specialise in small groups of painters or artistic schools and their typical portfolios of paintings are characterised by a low degree of diversification. All these circumstances will make collectors' behaviour at auction, if not predictable, at least intuitable by experienced auctioneers

auction houses (according to our definition) have an informative advantage which goes beyond the knowledge of past prices or the expertise on artistic factors affecting the value of a piece of art, as this sort of information can be grasped, at least in principle, by other market participants. Indeed, online databases of auction records, artists' catalogues, and art historical publications have improved information availability in the market. Nonetheless, neither good auction records, nor a good library are substitutes for market experience (Goetzmann 1995).

In this work we shed light on the value of such a "market experience" and precisely on the extent to which the informative advantage resulting from experience may translate into greater information efficiency. To this end, we answer the following questions:

(i) Are pre-sales provided by expert auctioneers more reliable (more precise) estimations of actual prices relative to those set by inexperienced?; (ii) Are sale rates associated with experienced auctioneers higher than those attained by low experienced auctioneers?; (iii) Do hammer prices of artworks auctioned by experienced auction houses systematically differ from those fetched at non-experienced auctioneers' sale rooms?

To answer these questions we use a sample of repeated auctions and classify each observation according to the information available to the auctioneer about the artwork: no information (no previous auction), previous experience auctioning the artist's works (artist experience), or a previous auction of the same artwork in the same house (artwork experience). We then perform an artwork fixed-effects regression analysis to explore whether the pre-sale prices, actual hammer prices, and estimation precision differ when the auctioneer has previous experience dealing with the artwork. The painting fixed effects allow us to observe changes in pricing and estimation for the *same* painting according to the information availability of the auctioneer, and control for all time-unvarying characteristics of the painting. In this sense, our regression analysis is similar to a hedonic regression where all possible fixed characteristics of a painting are included.

Moreover, our work has relevant implications for the Art&Finance community. Our results can contribute to the art market transparency in providing investors with a further criterion to assess the quality of information available in the market. In this regard, our findings may help understand the extent to which pre-sale estimates can serve

as reference points for the art valuation process and ultimately drive operators' investment strategy.

The paper is organized as follows. Section 2 illustrates the main related literature in art auctions. Section 3 presents the data for our empirical part, while Section 4 gives an overview of our results and includes a number of robustness checks. The final section concludes.

## **2. Related literature**

Our paper is related to several issues addressed by the existing literature on art auctions. It firstly deals with studies aiming at evaluating to what extent estimates are unbiased and fully informative (Ashenfelter 1989; Bauwens and Ginsburg 2000; Bruno and Nocera 2012). It also relates to contributions on the determinants of sale rates and prices (Beggs and Graddy 2008; Ashenfelter and Graddy 2011), including the impact of past prices due to the existence of some anchoring effect (Beggs and Graddy 2009). Moreover our paper refers to studies on art market anomalies, for example due to the existence of (i) a winner's curse as a consequence of difference in valuation between the high bidder and the underbidder (Goetzmann and Spiegel 1995) or (ii) the so called 'burned painting' anomaly, which implies that a failure to sell at an auction may negatively affect the future price (Anderson 1974; Ashenfelter and Graddy 2006).

Auction houses employ professionals who use their knowledge of art and the state of the market to develop their estimates. Several factors may influence those estimates, such as the reserve price, i.e. the minimum price the seller is willing to accept (Sproule and Valsan 2007, Ashenfelter and Graddy 2011), the artwork and artist related factors, as well as external factors associated to market conditions.<sup>10</sup>

In principle, due to the nature of their profession, auction houses are in the best position to have knowledge of all these factors and hence come with the best possible

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<sup>10</sup> As widely recognized by the literature on art auctions, pre-auction estimates account for many types of information. These may include characteristics of the artworks (e.g. its size, medium, expertise, and provenance) and of the artist (e.g. his/her living status, the historical significance and career's pattern), as well as past auction data (e.g. the name of the auctioneers, the location and time of previous sales, past prices) and financial market outlook. For a detailed description of factors affecting art valuations see among the others McAndrew (2010) and Sproule and Valsan (2006).

estimates of expected hammer prices (Sproule and Valsan 2006), where estimates should summarize all the relevant information available to auctioneers, both artistic and economic (Candela et al. 2004). Following the theoretical work of Milgrom and Weber (1982) who claim that honesty (i.e. always report all information completely) is the best policy, most of the research on art auction is concerned with the biasedness of pre-sale estimates. However, there is no consensus in whether estimates are reliable predictors of future prices, as different scenarios (either un-biasedness or overestimation/underestimation) are supported by the existing literature.

In this regard, Ashenfelter (1989) claims that estimates are usually accurate, being highly correlated with the prices achieved, though estimates do not consider all the relevant information. Lourgand and McDaniel (1991), by analyzing estimates and prices achieved by Sotheby's in New York, also find that auctioneers do not underestimate to a significant extent. McAndrew et al. (2009) using a set of French Impressionist paintings brought to auction from 1985 to 2001 show that bias do not exist as long as artworks that are bought-in at auction are included in the sample. Czujack and Martins (2004), on the basis of a data set of Picasso paintings sold at Christie's and Sotheby's in the period 1975-1994, show that both houses behave identically and have accurately predicted prices for the works sold.<sup>11</sup> In contrast, many authors have provided empirical evidence of the biasedness of pre-sale estimates. According to Beggs and Graddy (1997), overvaluation and undervaluation occur frequently. In their paper, they find that more recently executed Contemporary and Impressionist & Modern artworks are commonly overvalued. According to Ekelund et al. (1998), estimates are biased. By studying the Latin American art auctions from 1977 to 1996, they claim that the two major auction houses tend to underestimate prices. Bauwens and Ginsburgh (2000), by observing English silvery auctioned by Sotheby's and Christie's, show that estimates are slightly biased. Chanel et al. (1996) find that the pre-auction estimates for jewellery auctions are systematically below hammer prices. D'Souza and Prentice (2002) produce similar findings. Finally, Mei and Moses (2005), by analyzing a large data set of paintings sold

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<sup>11</sup> They also find that for the unsold works (which were overestimated), it would have been possible to set better estimates than those actually given by the salesrooms.

by Sotheby's and Christie's at least twice, find that pre-sale estimates contain an upward bias for expensive paintings over a long period of thirty years.

Belonging to the strand of literature on estimates' biasedness are also a few studies investigating the extent to which pre-auction estimates account for the available public information on artworks. Bauwens and Ginsburgh (2000) claim that auctioneers do not take into account all available information (namely that contained in the sales catalogues) when producing their estimates: their estimates could therefore be improved. Abowd and Ashenfelter (1989), however, suggest that pre-auction estimates are better predictors of prices than hedonic prices. Finally Sproule and Valsan (2006) suggest that hedonic models add little or no predictive power above and beyond that of the pre-auction estimates.

Looking at art market anomalies Anderson (1974) and Ashenfelter and Graddy (2006) identify the existence of the so called 'burned painting' anomaly, involving that a failure to sell at an auction may negatively affect the future price, or even deter potential buyers from buying the artwork by the resale, and thus generate a loss to its owner. Beggs and Graddy (2008) estimate that a failed auction may depress the return by nearly 30%. There are several explanations for this phenomenon. First of all, in models where bidders are correlated as in Milgrom and Weber (1982), the failure of an item to sell is informative about the value it might achieve in a future sale. It follows that assuming bidders have common values, a failure to sell might convey a negative message about the artwork's market value, which may be capitalized in bidders' valuations and thus depress the artwork's future price. Second, 'burning effect' may be explained by unfavorable changes in tastes and fashions or imply that the owner lowered the reserve price due to an urgent need to sell (Ashenfelter and Graddy 2006; Beggs and Graddy 2008). Finally, lower hammer price by the resale may result from a decrease in the reserve price (e.g. due to owner's urgent need to sell). However, as argued by Beggs and Graddy (2008), the adverse effect of failing at an auction on the rate of return could be reduced or even eliminated by putting the artwork back on the market more than two years after the initial

sale, or, irrespective of the time that has passed since the last auction, by moving the work to another auction house<sup>12</sup>.

In fact, there is no clear evidence of the effect of the holding period on art returns. On the one hand a resale within a short period of time seems to have an adverse effect on art returns. There are several factors behind it, such as the inelastic short run supply, information asymmetry between traders, and restrictions on arbitrage (short selling is impossible). Moreover, high transaction costs associated to art trading may erode profits and thus, suggest art investors to adopt a long term holding period to amortize expenses (Mei and Moses 2002). Frey and Pommerehne (1989a) claim that this view is also shared by e.g. Sotheby's, which advises its clients to hold purchased works for at least seven to ten years. Moreover, according to Candela and Scorcu (1997) collectors' tastes tend to change slowly and the collectors' pool also to increase slowly: thus, re-sale of a painting within a short period of time is unlikely, because of the almost certain capital loss. In addition, a quick reappearance on the market may generate mistrust as to the quality and value of the artwork among prospective buyers, especially in more opaque segments of the market (e.g. the Oldmasters). Finally, the art auction markets seems to be affected by the so called 'winner's curse', which is due to the difference in valuation between the high bidder and the underbidder (Goetzmann and Spiegel 1995). Should the purchaser immediately resell the artwork at auction, he would typically experience a negative return. This penalty is to be meant as a sort of liquidity premium or a bid-ask spread, which is commonly referred to as a 'winner's curse' "because it is an implicit cost that is conditional upon discovering you are the high bidder" (Goetzmann and Spiegel 1995, p. 550).

Nonetheless, as claimed by Frey and Pommerehne (1989b) extraordinary gains (so as losses) can be realized only within a short time horizon, which would result in exceptional high returns on an annual basis. Indeed, changes on the demand side can occur even within a short time span (Goetzmann and Spiegel 1995) and short term returns can be extremely high especially in time of booming prices (Locatelli Biey and Zanola 1999). This view is also in line with Baumol (1986), who finds that gains from art trading

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<sup>12</sup> However, according to Ashenfelter and Graddy (2011) it is unclear whether paintings really are burned, i.e. whether their failure to sell has caused a price decrease, or whether this is a fiction invented to encourage sellers to be satisfied with lower reserve prices.

approximate zero in the very long run. Interestingly, market practices seem to undermine the viewpoint that a resale within a short time interval is likely to result in a loss. As a matter of fact, it is not uncommon for art funds to manage the art portfolio actively through a high-turnover, to the purpose of lowering market volatility and increasing return on an annual basis.<sup>13</sup>

### 3. Data

Our base data set consists of all Italian paintings auctioned in the salerooms of 33 auction houses all over the world from 1985 to 2008, as provided by ARTINDEX-Munus database. The rough data set contains 101,846 observations corresponding to auctions of circa 90,000 unique paintings of more than 5,300 Italian artists belonging to one of three collecting categories: Old-Masters, 19<sup>th</sup> Century, and 20<sup>th</sup> Century. We remove from the data set all paintings with a high price estimate which is lower than \$1,000 US dollars, as well as auction houses focusing on minor artworks and those that do not provide pre-sales estimation ranges.

From this base dataset we select the artworks that have been auctioned at least twice during the observation period (10,358 observations). We next classify these observations according to whether they correspond to the first auction of a given artwork, or if it is a subsequent auction. To reduce a potential misclassification of the observations into first or subsequent auctions, we focus on the auctions occurring between years 1998 and 2008, and use the first years of our sample (1985-1997) as an observation period which allows for a more precise classification of the auctions. As robustness checks, we have repeated our analyses using different lengths for the observation period, with no material changes in our results.

Our final sample consists of 6,711 observations corresponding to 3,659 unique paintings of 1,207 artists. The majority of the paintings in our sample were auctioned in Italy (48%), followed by the UK (30%) and the US (10%); most of the auctions were held in Christie's, Sotheby's, or the Italian auction house Finarte-Semenzato (26%, 26%,

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<sup>13</sup> For example, that is the investment philosophy advertised and pursued by the Sharpe Art Funds claiming, on its website, that “the good performance of the Sharpe Art Fund can be achieved *only* with such a highly active trading approach”.

and 24%, respectively). Table 1 contains more details on the distribution of our sample according to country, auction house, and year of the auction.

**Insert Table 1 approximately here**

For all of the observations in our sample we have the pre-sale estimates provided by the auctioneer, as well as the hammer price in case the painting was sold. Table 2 contains some key summary statistics for these variables. Artworks in our sample have average estimation prices which range from about 50,000 to 70,000 US dollars, with median estimates of 12,000 to 16,000 US dollars.<sup>14</sup> The average sold painting was hammered at around 99,000 2008 US dollars; the median price was within to the median estimation range at around 13,000 dollars. More than half of the paintings in our sample belong to the Old Masters collecting category (54%), and less than one third belong to the XX century category.

We next perform an univariate analysis of the effects of experience in the valuation of artworks. To this end we classify our observations according to whether the painting appears in our database for the first time (“First auction”), and we classify repeated auctions according to whether the painting has or has not been previously auctioned in the same house (“Artwork experience” or “No artwork experience”, respectively).

2,891 paintings are auctioned in an auction house with previous experience with the painting. On average, artworks auctioned in experienced auction houses have lower estimates and hammer prices. Paintings auctioned in an expert house tend to be auctioned more frequently with a median of one year between auctions compared to almost three years for non-experts.

The descriptive statistics in this section show that there are differences in the paintings that are auctioned repeatedly in a same auction house relative to the paintings that change the auctioneer for subsequent auctions. However at this point we cannot claim that the observed differences are due to the discrepancies in market experience across auction houses. Many other factors could be playing a role; for example, our

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<sup>14</sup> In order to make prices and estimates comparable across different time periods, our currency unit throughout the study is 2008 US dollars.

univariate statistics show also that Christie's and Sotheby's are more likely to be auctioneers in repeated auctions. We cannot know from these univariate results whether the observed differences are caused, for example, by Christie's and Sotheby's evaluating paintings at a discount relative to other auction houses. Similarly, it is plausible that lower priced artworks tend to be auctioned in the same house and that this is what drives the observed differences. In addition, reduced prices can be determined by a general downturn trend in the art market as well as by indiosyncratic trends in taste. In this last respect common values (i.e. when buyers take into account the opinion of others while valuing an item) may play a role in explaining an artist's falling out of fashion (Beggs and Graddy 2009).

To deal with these issues we perform multivariate analyses and robustness checks in the following section.

**Insert Table 2 approximately here**

#### 4. Analysis

In this section we analyze whether the precision of the pre-sale estimates and the estimated or attained prices are different depending on whether the auction house has previous experience auctioning the artwork. For this purpose we begin our multivariate analysis by performing the following painting and auction house fixed-effects estimation on our sample of repeated auctions:

$$depvar_{ijt} = \alpha_i + first\ auction_{ijt} + experience_{ijt} + controls_{ijt} + \varepsilon_{ijt} \quad (1)$$

In the above equation,  $depvar_{ijt}$  refers to each of the following dependent variables relative to the auction of painting  $i$  in auction house  $j$  at time  $t$ :

- a) *loglow*, or the log of the low pre-sale estimate provided by the auctioneer;
- loghigh*, or the log of the high pre-sale price estimate; *currsale*, a dummy taking

the value of one if the painting was sold in the observed auction; *loghammer*, the log of the actual hammered price (in case the painting was sold);

b) a set of indicators of auctioneers' information efficiency, aimed to measure the extent to which estimates are reliable and accurate predictors of actual prices.

Precisely we include the following variables:

- *overestim*, *underest*, and *ontarget*, three dummies for whether the pre-sale prices provided by the auctioneer overestimated, underestimated, or predicted the hammer price, respectively;
- some measures of the relative distance from the midpoint of the estimation interval to the actual hammered price, both in real terms, *distance* and *esterror*, and in absolute value, *absdist* and *abserror* (see Appendix for a precise definition of these variables). The lower the distance, the greater the accuracy in predicting actual prices.

In constructing the *overestim*, *underest*, and *ontarget* variables we follow the mainstream literature on art auctions (see among the others Milgrom and Weber 1982 or Ashenfelter 1989) which considers the midpoint of the estimation interval (i.e. the average of the low and high pre-sale estimates) as the reference point to test for the biasedness of estimates. However, a few of contributions argue that the low estimate (as a proxy of the seller's reserve price) has a higher prediction power than other measures (i.e. the midpoint of the range and high estimate) with respect to the hammer price (Sproule and Valsan 2006). Thus, our set of depended variables also includes both the low and the high estimate.

The first dependent variable *first auction<sub>ijt</sub>* is a dummy taking the value of one if the observation corresponds to the first auction of the artwork, or zero for subsequent auctions. *experience<sub>ijt</sub>* is our main variable of interest and it measures whether auction house *j* has previous experience with the artwork or the artist. We define this variable in several ways: (i) *artist auctions*, i.e. the number of times auctioneer *j* has previously auctioned works by the same artist, (ii) *artist experience*, i.e. a dummy for whether auctioneer *j* has auctioned the artist's works more than 9 times, which is the median in our data set, and (iii) *artwork experience*, i.e. a dummy taking the value of one if the

same painting has been previously auctioned in auction house  $j$ . Notice that *artwork experience* can take positive values only for subsequent auctions; since we include also the dummy variable *first auction*, the experience variables will measure whether expert auctioneers behave differently relative to non-experts in subsequent auctions (i.e. when first auction equals 0).

The inclusion of painting fixed effects in the above specification allows us to compare the pricing and estimation precision of the *same* painting when it has not been auctioned before, or when it has been auctioned in an auction house with experience, relative to when it is auctioned in an auction house with no previous experience. Moreover the fixed effects control for all unobserved time-invariant characteristics of the paintings. Including painting fixed effects is similar to estimating a hedonic prediction of price which controls for *all* factors, both observed and unobserved, that affect the artwork's quality. As long as something drastic has not happened between sales—for example, that a painting has been deemed a fake, which is a very rare occurrence—the assumption of constant quality is a realistic one (Beggs and Graddy 2009). We are then able to identify the effect of auctioneer experience by further controlling for time-varying differences in demand with the inclusion of country, auctioneer, and time fixed effects.

#### **a. Baseline results**

Table 3.1 contains the first results of regressing equation (1) on our sample. In columns 1 to 5, the dependent variable is a dummy variable taking the value of one when the hammer price was within the pre-sale estimation range provided by the auctioneer, and zero if the price was outside this range or the artwork was not sold. In columns 6 to 10 the dependent variable is a dummy taking the value one when the artwork was sold in the current auction.

##### Effects of experience on the accuracy of estimates

We start by using as a proxy of auctioneer experience the number of times that the auctioneer has auctioned artworks of the same artist, and its square value. In column 1 we find that auctioneers with a larger number of previous auctions dealing with the artist's work are more likely to give precise estimates, but this knowledge advantage increases at

decreasing marginal rates. In column 2 we substitute the number of previous artist auctions with a further measure of experience, that is, a dummy taking the value one whenever the auctioneer has more than the median experience dealing with the artist's works (i.e., whenever the number of auctions of the artist in the same house is larger than or equal to the median value of nine). We similarly find that having previous experience dealing with the artist's works increases the probability of providing accurate pre-sale estimates. Moreover, this further measure of experience is also positively correlated with the probability of the artwork being sold in the auction, as column 7 shows.

These results seem to suggest that auctioning a piece of art at the salerooms of more experienced auctioneers confers to market participants informational benefits (estimates are more accurate proxy of future prices) and a higher probability of sale.

In columns 3 and 8 we enhance the specifications by adding "Artwork experience", which is an even stronger measure of experience as it takes a one if the auctioneer has previously dealt with the same artwork. This variable is also positively related to the probability of providing precise pre-sale estimates and on the probability of the item being sold.

In columns 4 and 9 we include other variables which could have an effect on the probability of an object being sold, and on the precision of auctioneer estimates: whether the painting was sold in the previous auction and the time elapsed between the current and the previous auction of the artwork, measured in years. Including the former variable into the regression tells us whether auctioneers incorporate information to the pre-sale prices above any information that could be revealed by the market prices of art. The latter variable captures the effect that the information available to the auctioneer could die over time<sup>15</sup>. We find that a sale in the previous auction makes it less likely for the artwork to be sold in the current auction. On the other hand, time has a negative effect on the probability of providing accurate estimates and on the probability of succeeding in selling the artwork, as expected. However, the positive effect of artwork experience on both dependent variables survives the inclusion of these variables.

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<sup>15</sup> It also may take into account "common value effects", that should decrease over time (Beggs and Graddy 2008). The assumption of common values reflects the idea that buyers may care about the opinion of others when valuing the item.

### Insert Table 3.1 approximately here

Finally, since artwork experience and artist experience could be very closely related, in columns 5 and 10 we repeat the specifications of columns 4 and 9 (respectively) excluding the artist experience variable. Our results for artwork experience are not affected by the exclusion of this variable, and moreover the explanatory power of our models diminishes only very marginally with the exclusion of the artist experience. For economies of space, in the remainder of the table we focus on the variable “Artwork experience; however results for “Artist experience” are qualitatively similar.

#### Effects of experience on prices and probability of sales

In Table 3.2 we repeat the specification in columns 5 and 10 with different dependent variables, to explore the effect of auctioneer experience in more detail. Our results indicate that the estimated price levels and the hammer price are significantly lower when the auctioneer has previous experience with the painting. In fact the coefficients for *Experience* are negative and highly statistically significant for the price estimates in columns 1 and to 2, and for the hammer price in column 5.<sup>16</sup>

Regarding the precision of the estimates, in columns 3 and 4 we find that expert auctioneers are less likely to overestimate the price of an artwork than auctioneers placing an object for the first time. On the other hand, expert auctioneers are more likely to be pessimistic and on average undervalue the paintings more often than non-experienced auctioneers. As a result, on average, expert auction houses are more likely to correctly predict the interval where the hammer will fall, as found in columns 1 to 5 of Table 3.1.

Conditionally on the artwork being sold, our results also show that auctioneers in general seem to apply the “honesty is the best policy” principle (Milgrom and Weber 1982): in fact, estimations in columns 6 and 8 show that pre-sale estimates are not

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<sup>16</sup> Since our independent variable of interest is in fact the interaction of two variables (a previous auction dummy and a same auction house dummy), we estimate all binary dependent variable regression with linear probability models. Estimating non-linear models when the independent variables are interaction terms yields results that are difficult to interpret (Ai and Norton, 2003).

consistently upward or downward biased for sold objects, conditionally on all the information available to the auctioneer.

In addition, in column 9 we do find that the absolute value of the deviations from the midpoint of the estimate to the actual hammer prices to be smaller for experienced auctioneers. In other words, conditionally on being sold, the estimates provided by auctioneers are not systematically above or below the hammer price; moreover their estimates are more often closer to the hammer value in absolute value.

### **Insert Table 3.2 approximately here**

Results in Tables 3 show some preliminary evidence that auctioneer experience in art auctions is valuable and informative. Tables 3 report other interesting results. For example, the coefficient for first auctions shows that all else equal, pre-sale estimates are higher the first time an artwork goes into auction. However, these items are often overvalued and are significantly less likely to be sold. Conditionally on being sold, these items do fetch higher prices than artworks auctioned and sold with experienced auctioneers (the difference in column 5 in Table 3.2 between coefficients of “Artwork experience” and “First auction” are statistically significant at a 1% confidence level). These results are consistent with Mei and Moses’ (2005) findings that some investors are credulous and tend to pay high prices when auction houses place a high value on the items. In particular, Mei and Moses (2005) claim that investors are more credulous when they have less information, as in the case of artworks with no past price history.

Results are also consistent with the existence of a winner’s curse in art auctions (Goetzman and Spiegel 1995)<sup>17</sup>. When auctioneers have no information from prior auctions about the market dynamics an past prices of an artwork, the winning bid is higher, all else equal, than the winner bid where the pre-sale estimated prices are provided by an experienced auctioneer. This suggests that the investor buying the artwork

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<sup>17</sup> The winners’ course derives from the difference in valuation between the high bidder and the underbidder (Goetzmann and Spiegel 1995). In other words, should the purchaser immediately resell the artwork at auction, he would typically experience a negative return. This penalty is a sort of liquidity premium or a bid-ask spread, which is commonly referred to as a ‘winner’s curse’ “because it is an implicit cost that is conditional upon discovering you are the high bidder” (Goetzmann and Spiegel 1995, p. 550).

in a first auction may have a negative return; this negative return in fact is significant when the subsequent auction is done in the house that auctioned the artwork the first time.

Summarizing it seems a greater experience being associated to more conservative estimates, lower hammer prices, but a higher probability to sell the artwork. Consistently, when a piece of art is auctioned for the first time, i.e. in lack of information about past prices and market dynamics, more optimistic approach in setting the estimates is generally adopted, this resulting in higher prices, but at the expense of a reduced probability of sale.

**b. (Preliminary) Robustness checks**

Our findings are robust to several specifications. In Table 4 we show that the main results in Table 3.2 do not change after controlling for the artist experience. Albeit artist experience does affect the estimates and their precision (in terms of  $\text{absdist}$ ), the coefficients of the artwork experience variable remains significant along all the specifications.

We repeat our analysis on some subsamples. Following the investors' credulousness argument of Mei and Moses (2005), in Table 5.1 we check whether experience plays a different role when Old Master artworks are auctioned. According to Mei and Moses (2005), it might be easier for auctioneers to use their "expertise" to sway potential investors in the Old Master market, i.e. a segment of the art market which tends to be more opaque than other collecting categories (e.g. Modern or Impressionist paintings) because of a wider difference of opinion as to authenticity, quality, and condition. In fact, we find that, when the painting belongs to the in the Old Master collecting category, experience plays a stronger role as far as the probability of being sold and the precision of the presale estimates are concerned. However, experience does not seem to affect the price level.

In Table 5.2 we focus only on the major auction houses, Sotheby's and Christie's and we find that the experience effect is always stronger for the most reputable auction houses.

Finally, as one could suspect that the artworks which are more likely to be auctioned in the same auction house are the better known ones, i.e., the masterpieces, in Table 5.3 we repeat our analysis on a subsample of artworks whose low presale estimates (in 2008 US dollars) belong to the highest quartile. Our results do not show significant differences with the rest of the paintings in our sample.

**Insert Tables 4, 5.1, 5.2, and 5.3 approximately here**

## **5. Conclusions**

Motivated by a growing interest in the art market from the financial community, this article has investigated whether and the extent to which information provided by experienced auctioneers positively affects art market efficiency. Our results confirm that pre-sale estimates provided by experienced auction houses contribute to art market efficiency by improving the quality of information available to market participants and increasing market liquidity. This result is robust to many different specifications.

Our results show that estimates provided by more experienced auctioneers are beneficial to *both* demand and supply side of the market. The former benefits from experienced auctioneers in terms of more precise and reliable estimates. The latter benefits from auctioneers in terms of a higher probability of sale, which is associated to experienced relative to non-experienced auction houses.

Nonetheless, a lower hammer price is more likely to be fetched at experienced auctioneers' sale rooms, this suggesting the existence of a winner's curse and the possibility for potential sellers to gain higher returns by moving to less experienced auction houses. However, changing auctioneers is a risky strategy since higher profitability seems to occur at the expense of artwork liquidity.

## References

- Abowd, J. and Ashenfelter, O. (1988), 'Art Auctions: Prices Indices and Sale Rates for Impressionist and Contemporary Pictures'. Mimeo, Department of Economics, Princeton University.
- Ai, C., and Norton, E.C. (2003), Interaction terms in logit and probit models, *Economics Letters*, 80, pp. 123–129
- Anderson, R.C. (1974), 'Paintings as an Investment', *Economic Inquiry*, 12(1): 13-26.
- Ashenfelter, O. (1989), 'How Auctions Work for Wine and Art', *Journal of Economic Perspectives*, 3(3), pp. 23-36.
- Ashenfelter, O., Graddy, K. and Stevens, M. (2003), "A study of sale rates and prices in Impressionist and Contemporary art auctions", *Mimeo*, Economic Department, University of Oxford.
- Ashenfelter, O. and Graddy, K. (2006), 'Art Auctions', in Ginsburgh, V. and Throsby, D. (eds.), *Handbook of the Economics of Arts and Culture*, Elsevier, North Holland, Amsterdam: 909-945.
- Ashenfelter, O. and Graddy, K. (2011), 'Sale Rates and Price Movements in Art Auctions', *American Economic Review: Papers & Proceedings*, 101(3), pp. 212–216.
- Baumol, W.J. (1986), 'Unnatural Value: Or Art Investment as Floating Crap Game', *American Economic Review, Papers and Proceedings*, 76(2), pp. 10-14.
- Bauwens, L. and Ginsburgh, V. (2000), 'Art experts and auctions: Are pre-sale estimates unbiased and fully informative?' *Recherches Économiques de Louvain / Louvain Economic Review*, 66(2), pp. 131-144.
- Beggs, A. and Graddy, K. (1997), "Declining values and the afternoon effect: Evidence from art auctions", *The RAND Journal of Economics*, Vol. 28, no. 3 , pp. 544-65.
- Beggs, A. and Graddy, K. (2008), 'Failure to Meet the Reserve Price: The Impact on Returns to Art', *Journal of Cultural Economics*, 32, pp. 301–320.
- Beggs, A. and Graddy, K. (2009), 'Anchoring Effects: Evidence from Art Auctions', *American Economic Review*, 99 (3), pp. 1027–1039.
- Bruno, B. and Nocera, G. (2012), 'Investing in Art and the Informational Content of Pre-Sale Estimates', Working Paper.

- Candela, G., and Scorcu A.E. (1997), 'A Price Index for Art Market Auctions. An Application to the Italian Market of Modern and Contemporary Oil Paintings', *Journal of Cultural Economics* 21: 175–196.
- Candela, G., Figini, P. and Scorcu, A.E. (2004), 'Price Indices for Artists – A Proposal', *Journal of Cultural Economics*, 28(4): 285-302.
- Chanel, O., Gérard-Varet, L.-A. and Ginsburgh, V. (1996), 'The Relevance of Hedonic Price Indices: The Case of Paintings', *Journal of Cultural Economics*, 20(1): 1-24.
- Czujack, C. and Martins, M.F.O. (2004), "Do art specialists form unbiased pre-sale estimates? An application for Picasso paintings", *Applied Economics Letters*, Vol. 11, no. 4, pp. 245–49.
- D'Souza, C. and Prentice, D. (2002), 'Auctioneer strategy and pricing: evidence from an art auction', *Marketing Intelligence & Planning*, Vol. 20, no. 7, pp. 417-427.
- Deloitte-ArtTactic (2013), Art & Finance Report 2013.
- Ekelund, R., Ressler, R., and Watson, J. (1998), "Estimates, bias and "no sales" in Latin-American art auctions, 1977–1996", *Journal of Cultural Economics*, Vol. 22, no. 1, pp. 33–42.
- Frey, B.S. and Pommerehne, W.W. (1989a), *Muses and Markets: Explorations in the Economics of the Arts*, Basil Blackwell, Oxford, UK and Cambridge, MA, USA.
- Frey, B.S. and Pommerehne, W.W. (1989b), 'Art Investment: An Empirical Inquiry', *Southern Economic Journal*, Vol. 56, no. 1, pp. 396-409.
- Goetzmann, W.N. (1995) 'The Informational Efficiency of the Art Market', *Managerial Finance*, Vol. 21, no. 6, pp. 25– 34
- Goetzmann W.N. and Spiegel, M. (1995), 'Private value components, and the winner's curse in an art index', *European Economic Review*, 39, pp. 549-555.
- Goetzmann W.N., Renneboog L., and Spaenjers C. (2011), "Art and Money." *American Economic Review*, Vol. 101, no. 3, pp. 222-226.
- JPMorgan (2012), The Art of Investing in Art,  
[http://www.jpmorgan.com/tss/General/The\\_Art\\_of\\_Investing\\_in\\_Art/1320507612236](http://www.jpmorgan.com/tss/General/The_Art_of_Investing_in_Art/1320507612236)
- Locatelli Biey, M. and Zanola, R. (2005), 'The Market for Picasso Prints: A Hybrid Model Approach', *Journal of Cultural Economics*, 29(2), pp. 127-136.
- Louargand, M.A. and McDaniel, J.R. (1991), "Price efficiency in the art auction market", *Journal of Cultural Economics*, Vol. 15, no. 2, pp. 53-65.

- Mandel, B.R (2009), ‘Art as an Investment and Conspicuous Consumption Good’, *American Economic Review*, Vol. 99, no. 4, pp. 1653–1663.
- McAndrew, C. and Thompson, R. (2004), “Are presale art auction estimates unbiased? Some affirming evidence”, Working Paper, Southern Methodist University.
- McAndrew, C. and Thompson, R. (2007), “The collateral value of fine art”, *Journal of Banking and Finance*, Vol. 31, no. 3, pp. 589-607.
- McAndrew, C., Smith, J., and Thompson, R. (2009), “The Impact of Reserve Prices on the Perceived Bias of Expert Appraisals of Fine Art”, *Journal of Applied Econometrics*, Vol. 27, no 2., 2012, pp. 235-252.
- McAndrew, C. (2010), *Fine Art and High Finance*, Bloomberg Press, New York.
- Mei, J. and Moses, M. (2002), ‘Art as an Investment and the Underperformance of Masterpieces’, *American Economic Review*, 92(5), pp. 1656-1668.
- Mei, J. and Moses, M. (2005), ‘Vested Interest and Biased Price Estimates: Evidence from an Auction Market’, *Journal of Finance*, 60(5), 2409-2435.
- Mei, J. and Moses, M. (2011), ‘Wealth Management for Collectors’, *The Journal for Investment Consulting*, 11(1), pp. 50-59.
- Milgrom R. and R.J. Weber (1982), ‘A Theory of Auctions and Competitive Bidding’. *Econometrica*, Vol. 50, No. 5. pp. 1089-1122
- Pesando, J.E. (1993), ‘Art as an Investment: The Market for Modern Prints’, *American Economic Review*, 83(5), pp. 1075-1089.
- Pesando, J.E. and Shum, P.M. (2007), ‘The law of one price, noise and “irrational exuberance”: the auction market for Picasso prints’, *Journal of Cultural Economics*, 31(4), pp. 263-277.
- Pommerehne, W.W. and Feld, L.P. (1997), ‘The Impact of Museum Purchase on the Auction Prices of Paintings’, *Journal of Cultural Economics*, Vol. 21, no. 3, pp. 249-271.
- Sproule, R. and Valsan, C. (2006), “Hedonic model and pre-auction estimates: Abstract art revisited”, *Economics Bulletin*, Vol. 26, no. 5, pp. 1-10.
- Sproule, R. and Valsan, C. (2007), ‘Reservation Prices and Pre-Auction Estimates: A Study in Abstract Art’, *Working Paper*, July.
- TEFAF (2013), Art Market Report.



**Table 1. Sample distribution***Panel A. Distribution by country*

Country	Number	% of total
ITALY	3 220	47,98
UK	2 037	30,35
USA	650	9,69
AUSTRIA	566	8,43
FRANCE	101	1,5
MONTECARLO	38	0,57
SWITZERLAND	38	0,57
HOLLAND	29	0,43
SWEDEN	28	0,42
GERMANY	3	0,04
AUSTRALIA	1	0,01

*Panel B. Distribution by auction house*

Auction house	Number	% of total
CHRISTIE'S	1 752	26,11
SOTHEBY'S	1 743	25,97
FINARTE-SEMENZATO	1 620	24,14
DOROTHEUM	566	8,43
BONHAMS & BUTTERFIELDS	264	3,93
FARSETTI ARTE	119	1,77
TAJAN	53	0,79
ARTCURIAL BRIEST	44	0,66
DOYLE	35	0,52
KOLLER	36	0,54
OTHER	479	7,14

*Panel C. Distribution by year*

Year	Number	I. Auctioned paintings			Number	% Sold	II. Sold paintings		
		Average Est. Price	Median Est. Price	Total Est. Price (US '000)			Average Price	Median Price	Total Price (US '000)
1998	471	46,84	20,07	22 100	208	44,2%	68,31	18,81	14 200
1999	444	50,70	18,35	22 500	207	46,6%	74,03	19,49	15 300
2000	590	47,31	13,06	27 900	239	40,5%	70,97	12,34	17 000
2001	672	49,05	12,09	33 000	253	37,6%	49,84	13,00	12 600
2002	609	59,20	12,88	36 100	241	39,6%	80,04	11,62	19 300
2003	625	54,01	13,47	33 800	254	40,6%	67,03	10,89	17 000
2004	605	46,82	14,90	28 300	253	41,8%	62,15	12,94	15 700
2005	677	52,54	14,61	35 600	316	46,7%	67,29	11,77	21 300
2006	793	80,78	12,85	64 100	355	44,8%	153,57	13,28	54 500
2007	762	95,94	12,51	73 100	349	45,8%	200,92	9,12	70 100
2008	463	74,65	13,74	34 600	199	43,0%	134,93	14,06	26 900

This table contains the distribution of the data according to: Country where the auction was held (Panel A), auction house (Panel B), and year of auction (Panel C). Est. Price is the estimated price, and is calculated as the arithmetic average of the high and the low pre-sale estimates provided by the auctioneer. Total Est. Price and (Total Price) is the sum of the estimated (hammer) prices of all auctioned (sold) paintings. All prices are deflated and correspond to one thousand 2008 US dollars.

**Table 2. Summary statistics**

	Panel A. Whole Sample			Panel B. First auction			Panel C Artwork experience			Panel D. No artwork experience			t-stat	p-val
	Mean	Median	St. Dev.	Mean	Median	Median	Mean	Median	St. Dev.	Mean	Median	St. Dev.		
<b>I. All paintings</b>	<b>N=6,711</b>			<b>N=2,762</b>			<b>N=2,891</b>			<b>N=1,058</b>				
<i>Pre-sale estimates</i>														
Low estimate	51,789	12,037	351,397	39,324	13,175	175,469	52,084	10,307	406,208	83,519	17,420	500,879	-1.833	0.067
High estimate	70,663	16,099	479,007	54,052	17,403	253,224	71522	13,828	561,566	111,683	23,072	651,485	-1.778	0.076
<i>Precision of estimates</i>														
sale	0.428	0.000	0.495	0.230	0.000	0.421	0.570	1.000	0.495	0.559	1.000	0.497	0.622	0.534
ontarget	0.200	0.000	0.400	0.099	0.000	0.299	0.271	0.000	0.445	0.267	0.000	0.442	-0.514	0.607
overestim	0.689	1.000	0.463	0.837	1.000	0.369	0.584	1.000	0.493	0.593	1.000	0.492	0.354	0.723
underest	0.111	0.000	0.314	0.064	0.000	0.245	0.145	0.000	0.352	0.141	0.000	0.348	0.292	0.770
<i>Previous auctions</i>														
Days since prev. auction	1,043.39	371.00	1,330.96	-	-	-	805.53	355.00	1,127.26	1,693.34	1,091.50	1,601.47	-16.591	0.000
Days since prev. sale*	1,910.18	1,456.00	1,649.14	-	-	-	1,772.81	1,286.50	1,598.35	2,093.02	1,646.00	1,698.68	-3.454	0.001
<i>Collecting category</i>														
Old Masters	0.538	1.000	0.499	0.546	1.000	0.498	0.611	1.000	0.488	0.320	0.000	0.467	17.086	0.000
XIX century	0.161	0.000	0.367	0.156	0.000	0.363	0.166	0.000	0.372	0.160	0.000	0.367	0.450	0.653
XX century	0.301	0.000	0.459	0.298	0.000	0.457	0.224	0.000	0.417	0.520	1.000	0.500	-17.200	0.000
<i>Auctioneer</i>														
Christies-Sothebys	0.521	1.000	0.500	0.508	1.000	0.500	0.565	1.000	0.496	0.434	0.000	0.496	7.334	0.000
Bonhams-Philipps	0.050	0.000	0.218	0.051	0.000	0.220	0.049	0.000	0.215	0.050	0.000	0.218	-0.169	0.866
Finarte-Semenzato	0.241	0.000	0.428	0.249	0.000	0.432	0.201	0.000	0.401	0.332	0.000	0.471	-8.007	0.000
Other	0.188	0.000	0.391	0.192	0.000	0.394	0.185	0.000	0.389	0.184	0.000	0.388	0.078	0.938
<b>II. Sold paintings</b>	<b>N=2,874</b>			<b>N=636</b>			<b>N=1,647</b>			<b>N=591</b>				
Hammer price	98,781	13,074	824,308	68,016	12,082	212,082	90,065	12,255	775,601	156,179	17,277	1,256,008	-1.200	0.230
distance	0.0915	-0.0828	0.6565	0.1277	-0.0667	0.7044	0.0763	-0.0800	0.6256	0.0949	-0.0889	0.6861	-0.578	0.564
absdist	0.3270	0.2000	0.5765	0.3682	0.2000	0.6138	0.3171	0.2000	0.5446	0.3103	0.1905	0.6191	0.236	0.814
esterror	0.0021	0.0090	0.0429	0.0013	0.0073	0.0508	0.0031	0.0089	0.0422	0.0004	0.0097	0.0349	1.480	0.139
abserror	0.0296	0.0221	0.0311	0.0328	0.0228	0.0387	0.0298	0.0229	0.0300	0.0255	0.0197	0.0239	3.472	0.001
ontarget	0.4659	0.0000	0.4989	0.4292	0.0000	0.4954	0.4760	0.0000	0.4996	0.4772	0.0000	0.4999	-0.048	0.962
overestim	0.2745	0.0000	0.4464	0.2925	0.0000	0.4552	0.2690	0.0000	0.4436	0.2707	0.0000	0.4447	0.139	0.890
underest	0.2596	0.0000	0.4385	0.2783	0.0000	0.4485	0.2550	0.0000	0.4360	0.2521	0.0000	0.4346	-0.082	0.934
Days since prev. auction	1,114.94	421.00	1,352.58	-	-	-	862.52	364.00	1,155.36	1,818.39	1,309.00	1,593.40	-13.376	0.000
Days since prev. sale**	1,923.36	1,464.00	1,629.82	-	-	-	1,757.80	1,282.00	1,588.42	2,166.34	1,788.00	1,661.42	-3.559	0.000

\*N=839, of which 744 auctioned in expert auctioneer; \*\* N=1,103, of which 499 auctioned in expert auctioneer

This table contains descriptive statistics for the set of paintings that were auctioned at least twice, between 1998-2008. Statistics are calculated for the whole sample in Panel A, and in Panels B-D in subsamples according to whether the paintings have not been auctioned before during the observation period (Panel B), the paintings have been auctioned in an auction house where it had been previously auctioned (Panel C – Artwork experience), and the paintings have been auctioned in an auction house where it had not been auctioned previously (Panel D – No artwork experience). The last two columns contain the T-statistic and the corresponding p-value for the hypothesis that the mean of each variable is equal in Panels C and D.

**Table 3.1 Experience, estimation precision, and auction outcome**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ontarget	ontarget	ontarget	ontarget	ontarget	currsale	currsale	currsale	currsale	currsale
first auction	-0.211*** [0.0129]	-0.211*** [0.0129]	-0.109*** [0.0238]	-0.160*** [0.0252]	-0.165*** [0.0251]	-0.401*** [0.0148]	-0.399*** [0.0147]	-0.201*** [0.0269]	-0.353*** [0.0253]	-0.357*** [0.0252]
artist auctions	0.00451*** [0.00174]					0.00107 [0.00199]				
[artist auctions] <sup>2</sup>	-4.18e-05*** [1.54e-05]					-7.46e-06 [1.76e-05]				
artist experience		0.118*** [0.0399]	0.125*** [0.0397]	0.0981** [0.0387]			0.138*** [0.0454]	0.151*** [0.0449]	0.0780** [0.0388]	
artwork experience			0.118*** [0.0231]	0.111*** [0.0265]	0.107*** [0.0264]			0.230*** [0.0261]	0.164*** [0.0266]	0.160*** [0.0265]
previous sale				-0.333*** [0.0248]	-0.338*** [0.0248]				-0.794*** [0.0249]	-0.797*** [0.0249]
years to prev. auction				-0.0220*** [0.00716]	-0.0207*** [0.00715]				-0.0251*** [0.00719]	-0.0241*** [0.00718]
constant	0.314*** [0.0686]	0.303*** [0.0661]	0.184*** [0.0700]	0.175** [0.0699]	0.253*** [0.0629]	0.652*** [0.0783]	0.572*** [0.0753]	0.337*** [0.0790]	0.381*** [0.0703]	0.443*** [0.0632]
Observations	6,711	6,711	6,711	6,711	6,711	6,711	6,711	6,711	6,711	6,711
R-squared	0.113	0.113	0.121	0.174	0.173	0.247	0.250	0.268	0.457	0.456
Number of paintings	3,659	3,659	3,659	3,659	3,659	3,659	3,659	3,659	3,659	3,659
Artwork F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auctioneer F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the coefficients and standard errors [in brackets] of painting and auction house fixed-effects OLS regressions. The dependent variables are a dummy variable that equals one if the hammer price is in the estimation range, zero if the price is outside the range or the artwork is unsold (*ontarget*) and a dummy variable that equals one if the artwork is hammered, zero if the artwork is unsold (*currsale*). The explanatory variables are defined as follows: *first auction* is a dummy variable that equals one if the artwork has not been previously auctioned, zero otherwise, *artist auctions* is the number of times the auctioneer has previously auctioned works by the same artist, *artist experience* is a dummy variable that equals one if the auctioneer has previously auctioned works by the same artist more than 9 times, zero otherwise, *artwork experience* is a dummy variable that equals one if the artwork has been previously auctioned in the same auction house, zero otherwise, *previous sale* is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise, *years to prev. auction* is the time, in year, that elapsed after the previous auction.

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 3.2 Experience, estimates, and estimation precision**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	loglow	loghigh	overestim	underest	loghammer	distance	absdist	esterror	abserror
first auction	0.195*** [0.0240]	0.200*** [0.0238]	0.237*** [0.0261]	-0.0718*** [0.0196]	0.125 [0.146]	0.216 [0.170]	0.152 [0.152]	-0.0130 [0.0103]	0.00414 [0.00794]
artwork experience	-0.313*** [0.0253]	-0.300*** [0.0250]	-0.154*** [0.0275]	0.0474** [0.0206]	-0.221** [0.0896]	-0.0995 [0.104]	-0.137 [0.0938]	0.000813 [0.00636]	-0.0102** [0.00488]
previous sale	0.421*** [0.0237]	0.416*** [0.0235]	0.520*** [0.0258]	-0.182*** [0.0193]	0.249* [0.146]	0.208 [0.170]	0.115 [0.153]	-0.0174* [0.0104]	0.00376 [0.00796]
years to prev. auction	0.0364*** [0.00684]	0.0337*** [0.00678]	0.0280*** [0.00744]	-0.00726 [0.00557]	0.0301 [0.0202]	0.00271 [0.0235]	-0.00262 [0.0211]	-0.000469 [0.00143]	0.000207 [0.00110]
constant	9.500*** [0.0602]	9.698*** [0.0596]	0.601*** [0.0654]	0.146*** [0.0490]	9.614*** [0.184]	-0.0799 [0.215]	0.0785 [0.193]	-0.00198 [0.0131]	0.0218** [0.0101]
Observations	6,711	6,711	6,711	6,711	2,874	2,874	2,874	2,874	2,874
R-squared	0.411	0.404	0.284	0.085	0.235	0.141	0.160	0.091	0.101
Number of paintings	3,659	3,659	3,659	3,659	2,388	2,388	2,388	2,388	2,388
Artwork F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auctioneer F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the coefficients and standard errors [in brackets] of painting and auction house fixed-effects OLS regressions. The dependent variables are defined as follows: *loglow* is the log of low pre-sale price estimate, in 2008 US dollars, *loghigh* is the log of high pre-sale price estimate, in 2008 US dollars, *overestim* is a dummy variable that equals one if the hammer price was below the estimation range or the artwork was unsold, zero otherwise, *underestim* is a dummy variable that equals one if the hammer price was above the estimation range, zero otherwise, *loghammer* is the log of the hammer price, in 2008 US dollars, *distance* is the ratio of the distance between the hammer price and the midpoint of the estimate range to the midpoint of the range, that is  $(\text{HammerPrice} - \text{MidpointEstimate}) / \text{MidpointEstimate}$ , *absdist* is the absolute value of *distance*, *esterror* is the ratio of the distance between the log of the midpoint of the estimate range and the log of the hammer price to log of the midpoint of the range, that is  $(\text{LogMidpointEstimate} - \text{LogHammerPrice}) / \text{LogHammerPrice}$ , *abserror* is the absolute value of *esterror*.

The explanatory variables are defined as follows: *first auction* is a dummy variable that equals one if the artwork has not been previously auctioned, zero otherwise, *artwork experience* is a dummy variable that equals one if the artwork has been previously auctioned in the same auction house, zero otherwise, *previous sale* is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise, *years to prev. auction* is the time, in year, that elapsed after the previous auction.

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 4 Experience, estimates, and estimation precision**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	loglow	loghigh	overestim	underest	loghammer	distance	absdist	esterror	abserror
first auction	0.187*** [0.0240]	0.191*** [0.0238]	0.230*** [0.0262]	-0.0701*** [0.0196]	0.125 [0.145]	0.216 [0.169]	0.151 [0.152]	-0.0130 [0.0104]	0.00413 [0.00793]
artist experience	-0.173*** [0.0369]	-0.182*** [0.0365]	-0.132*** [0.0402]	0.0339 [0.0301]	-0.226 [0.141]	-0.327** [0.164]	-0.359** [0.147]	0.00676 [0.0100]	-0.0117 [0.00768]
artwork experience	-0.321*** [0.0252]	-0.309*** [0.0250]	-0.160*** [0.0275]	0.0490** [0.0206]	-0.218** [0.0895]	-0.0950 [0.104]	-0.132 [0.0933]	0.000719 [0.00637]	-0.01000** [0.00488]
previous sale	0.413*** [0.0237]	0.408*** [0.0235]	0.514*** [0.0258]	-0.180*** [0.0194]	0.243* [0.146]	0.200 [0.170]	0.106 [0.152]	-0.0172* [0.0104]	0.00346 [0.00796]
years to prev. auction	0.0385*** [0.00683]	0.0360*** [0.00677]	0.0296*** [0.00744]	-0.00768 [0.00558]	0.0308 [0.0201]	0.00379 [0.0234]	-0.00143 [0.0210]	-0.000491 [0.00143]	0.000245 [0.00110]
constant	9.637*** [0.0667]	9.842*** [0.0661]	0.706*** [0.0727]	0.119** [0.0545]	9.777*** [0.210]	0.156 [0.245]	0.337 [0.219]	-0.00685 [0.0150]	0.0303*** [0.0115]
Observations	6,711	6,711	6,711	6,711	2,874	2,874	2,874	2,874	2,874
R-squared	0.415	0.409	0.286	0.086	0.239	0.149	0.170	0.092	0.106
Number of artw_id	3,659	3,659	3,659	3,659	2,388	2,388	2,388	2,388	2,388
Artwork F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auctioneer F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the coefficients and standard errors [in brackets] of painting and auction house fixed-effects OLS regressions. The dependent variables are defined as follows: *loglow* is the log of low pre-sale price estimate, in 2008 US dollars, *loghigh* is the log of high pre-sale price estimate, in 2008 US dollars, *overestim* is a dummy variable that equals one if the hammer price was below the estimation range or the artwork was unsold, zero otherwise, *underestim* is a dummy variable that equals one if the hammer price was above the estimation range, zero otherwise, *loghammer* is the log of the hammer price, in 2008 US dollars, *distance* is the ratio of the distance between the hammer price and the midpoint of the estimate range to the midpoint of the range, that is  $(\text{HammerPrice} - \text{MidpointEstimate}) / \text{MidpointEstimate}$ , *absdist* is the absolute value of *distance*, *esterror* is the ratio of the distance between the log of the midpoint of the estimate range and the log of the hammer price to log of the midpoint of the range, that is  $(\text{LogMidpointEstimate} - \text{LogHammerPrice}) / \text{LogHammerPrice}$ , *abserror* is the absolute value of *esterror*.

The explanatory variables are defined as follows: *first auction* is a dummy variable that equals one if the artwork has not been previously auctioned, zero otherwise, *artist experience* is a dummy variable that equals one if the auctioneer has previously auctioned works by the same artist more than 9 times, zero otherwise, *artwork experience* is a dummy variable that equals one if the artwork has been previously auctioned in the same auction house, zero otherwise, *previous sale* is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise, *years to prev. auction* is the time, in year, that elapsed after the previous auction.

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 5.1 Experience, auction outcome estimates, and estimation precision (Old Master artworks)**

VARIABLES	Old Masters							No Old Masters						
	(1) ontarget	(2) currsale	(3) loglow	(4) loghigh	(5) loghammer	(6) absdist	(7) abserr	(1) ontarget	(2) currsale	(3) loglow	(4) loghigh	(5) loghammer	(6) absdist	(7) abserr
first auction	-0.0967** [0.0415]	-0.300*** [0.0459]	0.171*** [0.0433]	0.163*** [0.0431]	0.265 [0.448]	0.787* [0.414]	0.0423* [0.0247]	-0.204*** [0.0340]	-0.376*** [0.0304]	0.209*** [0.0274]	0.222*** [0.0270]	0.0419 [0.107]	-0.0440 [0.111]	-0.00626 [0.00689]
artwork experience	0.178*** [0.0424]	0.222*** [0.0469]	-0.339*** [0.0443]	-0.334*** [0.0440]	-0.404 [0.301]	-0.195 [0.278]	-0.00575 [0.0166]	0.0762** [0.0375]	0.145*** [0.0336]	-0.239*** [0.0302]	-0.229*** [0.0297]	-0.134** [0.0653]	-0.0170 [0.0680]	-0.00358 [0.00421]
previous sale	-0.244*** [0.0377]	-0.851*** [0.0417]	0.332*** [0.0393]	0.316*** [0.0391]	0.453 [0.369]	0.517 [0.341]	0.0220 [0.0204]	-0.397*** [0.0349]	-0.778*** [0.0313]	0.426*** [0.0281]	0.431*** [0.0277]	0.137 [0.112]	-0.0174 [0.117]	-0.00372 [0.00723]
years to prev. auction	-0.0387*** [0.0110]	-0.0510*** [0.0122]	0.0392*** [0.0115]	0.0344*** [0.0114]	-0.00438 [0.0680]	-0.0454 [0.0628]	0.000328 [0.00375]	-0.0104 [0.0100]	-0.00888 [0.00898]	0.0337*** [0.00807]	0.0331*** [0.00796]	0.0395*** [0.0145]	-0.0120 [0.0151]	-0.000569 [0.000935]
constant	0.154 [0.139]	0.646*** [0.154]	9.664*** [0.145]	9.910*** [0.145]	7.153*** [1.478]	-7.598*** [1.365]	-0.164** [0.0816]	0.298*** [0.0782]	0.587*** [0.0700]	9.292*** [0.0630]	9.473*** [0.0620]	10.13*** [0.127]	0.242* [0.132]	0.0206** [0.00819]
Observations	3,611	3,611	3,611	3,611	1,338	1,338	1,338	3,100	3,100	3,100	3,100	1,536	1,536	1,536
R-squared	0.201	0.463	0.466	0.455	0.303	0.555	0.244	0.167	0.471	0.439	0.441	0.534	0.105	0.107
Number of artw_id	1,920	1,920	1,920	1,920	1,196	1,196	1,196	1,739	1,739	1,739	1,739	1,192	1,192	1,192
Artwork F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auctioneer F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the coefficients and standard errors [in brackets] of painting and auction house fixed-effects OLS regressions. The dependent variables are defined as follows: *ontarget* is a dummy variable that equals one if the hammer price is in the estimation range, zero if the price is outside the range or the artwork is unsold, *currsale* is a dummy variable that equals one if the artwork is hammered, zero if the artwork is unsold, *loglow* is the log of low pre-sale price estimate, in 2008 US dollars, *loghigh* is the log of high pre-sale price estimate, in 2008 US dollars, *overestim* is a dummy variable that equals one if the hammer price was below the estimation range or the artwork was unsold, zero otherwise, *loghammer* is the log of the hammer price, in 2008 US dollars, *absdist* is the absolute value of ratio of the distance between the hammer price and the midpoint of the estimate range to the midpoint of the range, *abserr* is the absolute value of the ratio of the distance between the log of the midpoint of the estimate range and the log of the hammer price to log of the midpoint of the range.

The explanatory variables are defined as follows: *first auction* is a dummy variable that equals one if the artwork has not been previously auctioned, zero otherwise, *artwork experience* is a dummy variable that equals one if the artwork has been previously auctioned in the same auction house, zero otherwise, *years to prev. auction* is the time, in year, that elapsed after the previous auction.

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 5.2 Experience, auction outcome estimates, and estimation precision (Artwork auctioned by either Christie's or Sotheby's)**

VARIABLES	Christies-Sothebys							Other						
	(1) ontarget	(2) currsale	(3) loglow	(4) loghigh	(5) loghammer	(6) absdist	(7) abserr	(1) ontarget	(2) currsale	(3) loglow	(4) loghigh	(5) loghammer	(6) absdist	(7) abserr
first auction	-0.172*** [0.0359]	-0.411*** [0.0338]	0.212*** [0.0360]	0.214*** [0.0360]	0.136 [0.175]	0.154 [0.186]	0.00339 [0.00737]	-0.160*** [0.0363]	-0.313*** [0.0394]	0.166*** [0.0306]	0.171*** [0.0296]	0.0472 [0.273]	0.128 [0.236]	0.00226 [0.0287]
artwork experience	0.138*** [0.0373]	0.198*** [0.0351]	-0.347*** [0.0374]	-0.344*** [0.0374]	-0.276** [0.119]	-0.173 [0.126]	-0.00823* [0.00499]	0.0640* [0.0383]	0.107*** [0.0415]	-0.276*** [0.0322]	-0.255*** [0.0311]	-0.0971 [0.121]	-0.0331 [0.105]	-0.00557 [0.0127]
previous sale	-0.369*** [0.0346]	-0.835*** [0.0325]	0.443*** [0.0346]	0.448*** [0.0346]	0.274 [0.177]	0.115 [0.189]	0.00444 [0.00746]	-0.298*** [0.0361]	-0.769*** [0.0391]	0.375*** [0.0304]	0.358*** [0.0294]	0.124 [0.267]	0.0595 [0.230]	-0.000871 [0.0280]
years to prev. auction	-0.0249*** [0.00902]	-0.0296*** [0.00848]	0.0327*** [0.00903]	0.0309*** [0.00903]	0.0349 [0.0248]	-0.000784 [0.0264]	-9.46e-05 [0.00104]	-0.0170 [0.0127]	-0.0248* [0.0138]	0.0584*** [0.0107]	0.0534*** [0.0104]	0.0238 [0.0399]	-0.0225 [0.0344]	-0.00162 [0.00418]
constant	0.285*** [0.0838]	0.620*** [0.0788]	9.686*** [0.0840]	9.896*** [0.0839]	10.35*** [0.249]	0.169 [0.265]	0.0168 [0.0105]	0.214* [0.113]	0.191 [0.123]	9.370*** [0.0953]	9.562*** [0.0921]	9.295*** [0.233]	0.312 [0.201]	0.0236 [0.0245]
Observations	3,873	3,873	3,873	3,873	1,928	1,928	1,928	2,838	2,838	2,838	2,838	946	946	946
R-squared	0.190	0.509	0.423	0.417	0.231	0.172	0.137	0.164	0.414	0.432	0.428	0.314	0.182	0.181
Number of artw_id	2,144	2,144	2,144	2,144	1,576	1,576	1,576	1,515	1,515	1,515	1,515	812	812	812
Artwork F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auctioneer F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the coefficients and standard errors [in brackets] of painting and auction house fixed-effects OLS regressions. The dependent variables are defined as follows: *ontarget* is a dummy variable that equals one if the hammer price is in the estimation range, zero if the price is outside the range or the artwork is unsold, *currsale* is a dummy variable that equals one if the artwork is hammered, zero if the artwork is unsold, *loglow* is the log of low pre-sale price estimate, in 2008 US dollars, *loghigh* is the log of high pre-sale price estimate, in 2008 US dollars, *overestim* is a dummy variable that equals one if the hammer price was below the estimation range or the artwork was unsold, zero otherwise, *loghammer* is the log of the hammer price, in 2008 US dollars, *absdist* is the absolute value of ratio of the distance between the hammer price and the midpoint of the estimate range to the midpoint of the range, *abserr* is the absolute value of the ratio of the distance between the log of the midpoint of the estimate range and the log of the hammer price to log of the midpoint of the range.

The explanatory variables are defined as follows: *first auction* is a dummy variable that equals one if the artwork has not been previously auctioned, zero otherwise, *artwork experience* is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise, *previous sale* is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise, *years to prev. auction* is the time, in year, that elapsed after the previous auction.

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 5.3 Experience, auction outcome estimates, and estimation precision (Masterpieces)**

VARIABLES	Masterpieces (Estimated price, top 25%)							No Masterpieces (lower 75% estimated price)						
	(1) ontarget	(2) currsale	(3) loglow	(4) loghigh	(5) loghammer	(6) absdist	(7) abserr	(1) ontarget	(2) currsale	(3) loglow	(4) loghigh	(5) loghammer	(6) absdist	(7) abserr
first auction	-0.1000** [0.0436]	-0.320*** [0.0428]	0.151*** [0.0544]	0.157*** [0.0542]	-0.0978 [0.363]	0.335 [0.340]	0.00883 [0.0130]	-0.198*** [0.0309]	-0.381*** [0.0314]	0.231*** [0.0236]	0.236*** [0.0233]	0.271** [0.135]	0.219 [0.154]	0.00785 [0.0104]
artwork experience	0.200*** [0.0468]	0.227*** [0.0458]	-0.411*** [0.0583]	-0.406*** [0.0581]	-0.385* [0.215]	-0.256 [0.202]	-0.0152** [0.00769]	0.0643** [0.0323]	0.132*** [0.0329]	-0.252*** [0.0248]	-0.235*** [0.0245]	-0.0923 [0.0874]	-0.0907 [0.0993]	-0.00863 [0.00671]
previous sale	-0.307*** [0.0431]	-0.875*** [0.0422]	0.500*** [0.0538]	0.500*** [0.0535]	0.187 [0.344]	0.261 [0.323]	0.00321 [0.0123]	-0.356*** [0.0305]	-0.764*** [0.0310]	0.385*** [0.0234]	0.377*** [0.0231]	0.348** [0.141]	0.196 [0.161]	0.00883 [0.0109]
years to prev. auction	-0.0253** [0.0106]	-0.0134 [0.0104]	0.0240* [0.0132]	0.0271** [0.0131]	0.0394 [0.0398]	0.0153 [0.0373]	0.000973 [0.00142]	-0.0196* [0.0100]	-0.0381*** [0.0102]	0.0536*** [0.00769]	0.0456*** [0.00760]	0.0143 [0.0225]	-0.00171 [0.0255]	7.09e-05 [0.00172]
constant	0.154* [0.0880]	0.491*** [0.0863]	10.68*** [0.110]	10.86*** [0.109]	10.92*** [0.375]	0.0903 [0.352]	0.0218 [0.0134]	0.359*** [0.112]	0.444*** [0.114]	9.180*** [0.0855]	9.371*** [0.0845]	9.153*** [0.229]	-0.0777 [0.260]	-0.00473 [0.0175]
Observations	2,280	2,280	2,280	2,280	1,088	1,088	1,088	4,431	4,431	4,431	4,431	1,786	1,786	1,786
R-squared	0.200	0.503	0.375	0.368	0.370	0.376	0.266	0.183	0.446	0.498	0.491	0.209	0.147	0.106
Number of artw_id	1,334	1,334	1,334	1,334	908	908	908	2,325	2,325	2,325	2,325	1,480	1,480	1,480
Artwork F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auctioneer F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the coefficients and standard errors [in brackets] of painting and auction house fixed-effects OLS regressions. The dependent variables are defined as follows: *ontarget* is a dummy variable that equals one if the hammer price is in the estimation range, zero if the price is outside the range or the artwork is unsold, *currsale* is a dummy variable that equals one if the artwork is hammered, zero if the artwork is unsold, *loglow* is the log of low pre-sale price estimate, in 2008 US dollars, *loghigh* is the log of high pre-sale price estimate, in 2008 US dollars, *overestim* is a dummy variable that equals one if the hammer price was below the estimation range or the artwork was unsold, zero otherwise, *loghammer* is the log of the hammer price, in 2008 US dollars, *absdist* is the absolute value of ratio of the distance between the hammer price and the midpoint of the estimate range to the midpoint of the range, *abserr* is the absolute value of the ratio of the distance between the log of the midpoint of the estimate range and the log of the hammer price to log of the midpoint of the range.

The explanatory variables are defined as follows: *first auction* is a dummy variable that equals one if the artwork has not been previously auctioned, zero otherwise, *artwork experience* is a dummy variable that equals one if the artwork has been previously auctioned in the same auction house, zero otherwise, *previous sale* is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise, *years to prev. auction* is the time, in year, that elapsed after the previous auction.

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

## Appendix A. Variable definitions

loglow	is the log of low pre-sale price estimate, 2008 US dollars
loghigh	is the log of high pre-sale price estimate, 2008 US dollars
loghammer	is the log of the hammer price in 2008 US dollars or object unsold
first auction	is a dummy variable that equals one if the artwork has not been auctioned in previous 12 years, zero otherwise
artist auctions	is the number of times the auctioneer has previously auctioned works by the same artist
artist experience	is a dummy variable that equals one if the auctioneer has previously auctioned works by the same artist more than 9 times, zero otherwise
artwork experience	is a dummy variable that equals one if the artwork has been previously auctioned in the same auction house, zero otherwise
previous sale	is a dummy variable that equals one if the artwork was sold in the previous auction, zero otherwise
currsale	is a dummy variable that equals one if the artwork was hammered, zero if the artwork was unsold
years to prev. auction	is the time, in year, that elapsed after the previous auction
ontarget	is a dummy variable that equals one if the hammer price was in estimation range, zero if the price was outside the range or the artwork was unsold
overestim	is a dummy variable that equals one if the hammer price was below the estimation range or the artwork was unsold, zero otherwise
underest	is a dummy variable that equals one if the hammer price was above the estimation range, zero otherwise
distance	$= (\text{HammerPrice} - \text{MidpointEstimate}) / \text{MidpointEstimate}$
absdist	is the absolute value of Distance
error	$= (\text{LogMidpointEstimate} - \text{LogHammerPrice}) / \text{LogHammerPrice}$
abserror	is the absolute value of Error