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ABSTRACT

Aggregate art price patterns mask a lot of underlying variation—both in the time series and in the cross-section. We argue that, to increase our understanding of the market for aesthetics, it is helpful to take a micro perspective on the formation of art prices, and acknowledge that each artwork gives rise to a market for trading in its private-value benefits. We discuss relevant recent literature, and illustrate the potential of this approach through a historical study of art price records between 1701 and 2014. Our newly constructed series also points to the importance of developments in the industrial organization of the art market for long-term price trends.

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I. Introduction

Over the last half century, a growing literature in economics has substantially improved our knowledge of the risk-return properties of diversified art portfolios, the correlation patterns between artwork characteristics and prices, and the impact of shifts in income and wealth distributions on average art prices. Yet, the aggregate time-series dynamics and average cross-sectional pricing differences hide a lot of variation—variation that is very relevant to collector-investors (who are typically undiversified) and to observers of the art market (who often want to learn about the dynamics of art buyers' preferences from prices).

In this paper, we argue that, to further increase the economic understanding of the market for aesthetics, we need to examine the formation of art prices on a disaggregate level. Our starting point is that anybody's valuation of an artwork should be a function of both the expected (non-financial) private-value benefits over the holding period and the expected (financial) resale revenues (Lovo and Spaenjers, 2014). Of course, the latter cashflow is in itself endogenously related to the distribution of tastes among potential buyers at the time of resale. Each individual artwork thus gives rise to a market for trading in its (current and future) private-value benefits. Within this framework, we discuss recent theoretical and empirical studies on the different forces driving the willingness to pay of bidders at art auctions. Emerging conclusions of this body of work are that the enjoyment associated with art ownership is multi-faceted, that preferences interact with wealth in determining the magnitude of private values, and that beliefs about resale revenues affect auction outcomes.

We then illustrate the relevance of a micro perspective on the formation of art prices through a particular case study. Based on historical research, we identify 35 sales of artworks between 1701 and 2014 that set price records (in nominal GBP terms) at auction. At one time in history each of these pieces held the special distinction of being the most expensive work of art ever sold through a commonly observed market. A review of these works reveals an interesting paradox: an extraordinary price does not necessarily equate to a unique or extraordinary artwork. Moreover, the timing of record transactions does not always coincide with general periods of price increases. Based on an in-depth study of the different sales in our series, we conclude that auction price records are often set in situations characterized by one or more of the following elements: (i) extreme supply constraints, (ii) instances of social competition among "nouveaux riches", (iii) resolution of uncertainty about the potential resale value of the artwork, and (iv) idiosyncratic shifts from hedonic weights. Going beyond the main focus of this paper, our historical study also suggests the importance of developments in the industrial organization of the market in driving aggregate price trends.

The remainder of this paper is organized as follows. Section II reviews the main strands of the literature on art prices. Section III evaluates where progress can still be made, and Section IV reviews recent contributions that go in this direction. Section V presents our record series, and Section VI explains how it illustrates the relevance of a micro perspective on art prices. Section VII briefly discusses the importance of considering institutional changes in the art market when looking into long-term price trends. Section VIII concludes.

II. Main Strands of the Literature on Art Prices

II.1. Art price indexes and the risk-return trade-off

The first efforts to estimate the investment performance of art occurred in the early 1960s. A popular book by Rush (1961) presented indices for different artistic genres and even included a comparison with stocks (Coslor and Spaenjers, 2013). Academic interest in the topic grew with a number of contributions (e.g., Anderson, 1974; Baumol, 1986; Goetzmann, 1993) that used auction sales data compiled by Reitlinger (1961). Over the last two decades, researchers have applied hedonic and repeat-sales regressions—methods to estimate price indexes for infrequently traded assets—to ever-larger databases of art auction sales (e.g., Mei and Moses, 2002; Renneboog and Spaenjers, 2013). Some studies focus on particular media (e.g., Pesando, 1993) or specific artist nationalities (e.g, Agnello and Pierce, 1996; Renneboog and Van Houtte, 2002). Even if different papers come to different conclusions with respect to the long-term returns to art investments, estimated returns generally beat inflation but remain below the performance of equities. Over the last half century, returns may have been better at the higher end of the market (e.g., Renneboog and Spaenjers, 2013).

Recent reseach has pointed to a number of potential methodological issues with price index estimates. For example, there is the issue of endogeneity of trading. Items may only (re)sell if they have gone up in value (Goetzmann, 1996). Korteweg, Kräussl, and Verwijmeren (2013) correct for such survivorship bias and find that repeat-sales art price indexes may have to be adjusted downwards. Next, art price indexes may underestimate the volatility of the underlying portfolio of assets, as they are estimated using price data that are typically aggregated over annual periods (e.g., Campbell, 2008; Renneboog and Spaenjers, 2013).

II.2. Hedonic pricing

Hedonic regressions do not only enable the construction of price indexes, but they also allow insight into what are the price-determining or "utility-bearing" (Rosen, 1974) characteristics of artworks. Hedonic models estimated in art price studies typically include easily quantifiable characteristics of the work (e.g., size, medium, strength of attribution) and the artist (e.g, artist dummies and/or reputation measures). The regression results then show the implicit "premia"—and thus the average willingness to pay among art buyers—associated with certain characteristics. (To allow for changes in the shadow prices over time, one can apply an "adjacent-period" model (Triplett, 2004) in which hedonic regressions are estimated separately over smaller subperiods.) For example, Renneboog and Spaenjers (2013) find that works that are "attributed to" an artist are on average 52% cheaper than works that are undoubtedly by the artist; the authors also quantify the premia that art buyers are paying on average for oil paintings, signed works of art, self-portraits, etc. Next to variables related to the work and the artist, hedonic models often also include characteristics of the sale (e.g, auction house, month of sale), which are supposed to pick up otherwise unobservable differences in quality.

II.3. Wealth, income, and art market returns

An artwork is essentially a claim on an infinite stream of non-financial consumption dividends, namely the pleasure and pride experienced by its consecutive owners. As such consumption of art is discretionary, the marginal utility of—and therefore the willingness to pay for—its non-pecuniary payoffs can be expected to vary with wealth shocks (Aït-Sahalia, Parker, and Yogo, 2004). Art price indexes typically drop in recessionary periods. Several of the previously-mentioned papers has also found a positive correlation between (lagged) equity returns and price changes in the art market.

As masterpieces are unique and indivisible goods that are in excess demand, the number and the buying power of wealthy households may be more relevant in determining the price of high-end art than the average wealth across all households—just like for real estate in "superstar cities" (Gyourko, Mayer, and Sinai, 2013). Goetzmann, Renneboog, and Spaenjers (2011) find evidence that high-end art prices tend to go up in periods of increasing income inequality.

III. Where Do We Stand, and Where To Go Next?

The literature has painted a clear picture of the aggregate historical dynamics of the art market, and of the average long-term returns. This work is important, because it allows to compare the risk-return profile of "art" —or a certain type of art—with those of other asset classes, and to evaluate the potential role for diversified art collections—or even art investment funds—in a portfolio. At the same time, however, it should be recognized that price indexes hide a lot of variation, and may not be representative of the price dynamics for any individual artist or artwork. We can get a sense of how much of the variation in art prices is systematic by looking at the R-squareds of repeated-sales regressions. Goetzmann (1993) and Mei and Moses (2002) report that their indexes explain 0.59 and 0.64 of the sample return variation, respectively. Art price indexes thus leave a substantial part of the returns on individual objects unexplained, which is especially relevant as many collector-investors—by choice or by lack of investable capital—focus on a very small of artists and thus tend to be undiversified. Relatedly, even if hedonic models do rather well in explaining cross-sectional price differences between artworks, they mask variation in the distribution of preferences—aesthetic or not—that exists for each individual work. Furthermore, the structure of both preferences and wealth across potential art buyers may change over time, and expectations about the future market conditions for an artwork will of course affect anybody's willingness to pay for an artwork today. For all these reasons we may be able to increase the economic understanding of the auction market for aesthetics by going beyond aggregate price dynamics, and acknowledging that a separate trading "market" is associated with each individual artwork.

IV. New Perspectives on Art Prices

The basic framework that we use in this paper is borrowed from Lovo and Spaenjers (2014). The authors formalize the concept of an "emotional dividend", by defining it as how much an individual would be willing and able to pay for each period of ownership of an artwork. It is thus the quantitative counterpart of the non-financial utility associated with being an art owner. Anybody's valuation of an artwork then equals the present value of the emotional dividends from the item that can be enjoyed between purchase and resale, plus the present value of the expected auction proceeds (net of transaction costs) at resale. Or, more formally, any individual *i*'s valuation can be expressed as follows:

$$PV_{i,t} = PV(\text{emotional dividends})_{i,t \rightarrow t'} + PV(\text{resale revenues})_{t'} \quad (1)$$

where t is the time of purchase and t' is the (optimally selected) time of resale. The magnitude of the emotional dividend per period—which determines the first, private-value component in equation (1)—depends both on individual *i*'s preferences and on his financial wealth. The expected resale revenues—which determine the second, common-value component in equation (1)—are endogenous to the *distribution* of emotional dividends in the population of bidders at time t': the resale price can be expected to be higher if more individuals derive high enjoyment from the work. This element of the time-t valuation should be the same for all non-credit-constrained bidders planning to resell at t'.

In the following paragraphs, we will review recent literature on the nature of the emotional dividends or private-value benefits associated with art ownership, on the interaction between preferences and wealth in determining the distribution of private values, and on the impact of (beliefs about) the common-value component on the willingness to pay.

IV.1. Private-value benefits

It is important to recognize that the preferences underpinning the non-financial utility that individuals derive from owning an artwork can have many origins. Of course, there is the viewing pleasure, and the admiration of artistic skill or "genius". But why are duplicates then not worth as much as original artworks? And why do we observe price differences between works with different strengths of attribution to Old Masters (Renneboog and Spaenjers, 2013) or between original and posthumous Rembrandt prints (Lazzaro, 2006)? Recent research by Newman and Bloom (2012) documents two underlying psychological mechanisms that could explain these findings: both "the assessment of the art object as a unique creative act (performance) and the degree of physical contact with the original artist (contagion)" have an effect on people's valuations.

A subtle twist is that the pride and enjoyment associated with ownership may be much stronger than the pleasure experienced by art lovers when in front of a work of art that they like. Frey and Eichenberger (1995) argue that "an art object yields additional benefits if it is owned (and not just rented) because the art object's 'aura' is therewith appropriated". The importance of such ownership effects could explain the absence of a well-developed art rental market.

Art buyers may not only be paying for the personal satisfaction of ownership; the social aspect is probably important as well, for example because of the Veblenian idea of conspicuous consumption. Heffetz (2011) shows that there is a relation between the visibility of expenditures on a category of goods and the elasticity of consumption with respect to income. There may of course be cross-sectional variation in the visibility of art spending that is related to the type of art purchased. Anecdotal evidence suggests that one reason for the popularity of artists like Jeff Koons, Damien Hirst, Andy Warhol, etc. in recent years is their recognizability—even to people who can hardly be described as connoisseurs. (An alternative explanation for why many of the world's wealthy regularly seem to compete for the same items is that public perceptions of one's preferences may determine social status (Bernheim, 1994). In this view, famous art collectors' intrinsic preferences are not necessarily aligned, but they conform to a homogeneous standard of behavior out of status concerns.)

Yet, the durability of art makes it not only a consumption good, but also a store and display of wealth. If wealth provides social status, then it may directly enter into the utility function of economic agents. In the presence of such a "capitalist spirit" (e.g., Bakshi and Chen, 1996; Carroll, 2000), the wealthy may pay a premium for art relative to the stream of consumption services that is inherent to the artwork. Mandel (2011) constructs an asset pricing model that incorporates a conspicuous utility dividend that is a function of the art's price. It thus formalizes a relation between the private-value and the common-value components of an artwork's value.

Also social competition within the more limited confines of the auction room may be important. Auction participants may get utility from winning for winning's sake—to be the "top dog"

(Shogren and Hayes, 1997). Even if the experimental evidence for such an effect is limited (Holt and Sherman, 1994; Shogren and Hayes, 1997), it could play a more important role when members of the global elite are competing for a trophy item.

The above observations that ownership is a condition for full enjoyment and that the need for social recognition may impact bidding behavior also suggests the importance of supply in the determination of prices. We define supply as the number of artworks of an artist that are still in private hands. Supply typically shrinks over time, as museums continue acquiring items but only rarely de-accession. Moreover, there is the issue of re-attributions. For many Old Masters, the number of works that are considered to be executed by the master himself has decreased as attention to authenticity heightened and technology advanced over the twentieth century; Seinstra (2014) shows how the number of paintings included in various Rembrandt "oeuvre catalogues" more or less halved over the twentieth century. If supply is severely constrained, bidders may be faced with their one and only opportunity to acquire an item by a certain artist if it comes up for sale, reinforcing the idea that an auction can indeed be "won", and inducing exceptionally high demand.

The above discussion makes clear that the emotional dividends—the non-financial utility—from acquiring and owning an artwork can take many different forms. Whether hedonic regression models are able to explain cross-sectional price variation between art objects depends on whether hedonic characteristics capture these private-value-determining features and on whether there exist a lot of idiosyncratic shifts from average preferences. (It is probably not a surprise that hedonic regression models perform exceptionally well in the market for diamonds.)

IV.2. Time-series variation in the distribution of private values

Aggregate art price indexes will capture the price dynamics of individual artists or works more accurately if there is a substantial systematic component in how emotional dividends change over time. There will be less variation in price changes around the average trend if preferences are relatively stable over time. While the multi-dimensional nature of preferences for artworks makes this hard to evaluate, it seems that aesthetic tastes at least do not change as much as sometimes assumed, even over longer time frames (Graddy, 2013). However, it is important to recognize that changing wealth patterns may still change the structure of art prices, by making certain groups of individuals' preferences more impactful. Hiraki et al. (2009) find a strong correlation between the demand for art by Japanese collectors and Japanese stock prices, leading to an increase in Impressionist and Post-Impressionist art during the "bubble period" in the Japanese economy. Renneboog and Spaenjers (2014) show that national equity markets help explaining country-specific art returns, but less for the artists with the highest reputations. So, while the correlation between the aggregate movements of wealth and art prices (cf. Section II) are interesting, the interaction between regional wealth patterns and local cultural tastes certainly deserves as much attention.

IV.3. Beliefs about the common-value component

It is clear that rationally-behaving art owners will only want to resell when the expected auction proceeds exceed the (individual-specific) value of continued ownership. Under certain conditions, increases in price levels in the art market may thus trigger increases in the volume of consignments to auction houses. One factor that will directly impact expected auction proceeds is a change in the number of bidders in the market (Goetzmann and Spiegel, 1995; Lovo and Spaenjers, 2014). If there is uncertainty about what the shape of the (future) distribution of private-value benefits—which determines the common-value component—looks like, then also changes in the beliefs about this distribution should impact the valuation of an artwork. Using survey data, Pénasse, Renneboog, and Spaenjers (2014) find that, in the cross-section, optimistic beliefs in the market outlook for specific artists are correlated with higher prices. Beggs and Graddy (2008) show downward price trends after buy-ins (i.e., items failing to reach the reserve price), which can be explained by common-value effects. Also decreases or increases in the uncertainty surrounding the common-value component may of course affect valuations. Finally, and relatedly, differences of opinion about the expected resale value may encourage relatively pessimistic art owners to sell to optimists, in the spirit of, for example, Scheinkman and Xiong (2003).

V. Art at Auction: A Record of Records

On 12 November 2013, "Three Studies of Lucian Freud", a Francis Bacon triptych, was sold through auction in New York. An anonymous bidder paid 127 million USD, or almost 90 million

GBP, for the work—a new world record price for a work of art at auction. Like previous record sales, the transaction was covered extensively by the popular press, and triggered both unbelief—"how can a painting be worth so much money?"—and even anger—"it's morally very wrong". In this section, we construct a long-term history of auction record prices, going back to the start of the eighteenth century.

V.1. Defining and identifying records

We use the following criteria to identify art auction record prices. First, we only consider artworks (created by an identifiable artist), so no books, jewelry, etc. We exclude lots in which multiple artworks are pooled together. Second, the work needs to be traded at a public auction. Moreover, we only consider the highest price from each auction: if a record gets broken within the same sale, we exclude it from the list. Third, at the auction the work needs to be acquired by a party other than the consignor. In other words, we consider record-breaking reserve prices as irrelevant. Fourth, we consider prices including auction house transactions costs payable by the winning bidder, as we want to capture the total sum laid out by the acquirer. Christie's and Sotheby's introduced a buyer's premium in the 1970s, but other auction houses already had buyer's fees in place before. (However, we do not consider VAT and other taxes.) Fifth, it is clear that the currency perspective may matter. Because the global art market for a very long time was centered in London, we take a GBP perspective. New York only became an important trading place for art in the twentieth century.

Even starting from such clear guidelines, the identification of record-breaking transactions in the history of the art auction market is difficult. Although online art auction databases have good coverage going back until the 1960s at least, no exhaustive online or offline database exists for older auctions. However, throughout history, a number of different "repertoires" or "indexes" listing art auction sales have been published. The starting point of our research is a book published in 1961 by art historian Gerard Reitlinger, titled "The Economics of Taste: The Rise and Fall of Picture Prices, 1760-1960". Reitlinger listed for a wide range of artists a history of prices, sometimes even going back to before 1760. However, closer examination of the highest prices in Reitlinger reveals that many of the prices included are not auction prices, but prices of private transactions, reserve prices, estimates, and so on. We exclude all these non-auction prices. We then further investigate all remaining relevant entries, by cross-checking and potentially correcting the sale and price information in Reitlinger with a number of sources, such as the online art historical databases Lugt's Répertoire Online and the Getty Provenance Index. We also consult (often annotated) hard copies of the original auction catalogues in the National Art Library in London, or alternatively order them from online booksellers. We only include a potentially record-breaking transaction in our list if it does not violate any of the criteria spelled out before, and if the available evidence allows us to determine the location and date of the auction, and the exact price paid.

We then review a number of additional historical auction sale repertoires, to see whether there are any record sales between 1701 and 1960 not included in Reitlinger. We identify two records for the early 1700s (using an exchange rate of 11 guilders to the pound) in a collection of priced Dutch art auction catalogues put together by Gerard Hoet (1752). Automized queries on the text of the two volumes of Roberts (1897) describing the important sales at Christie's between 1766 and 1896, and of the seven volumes of eighteenth- and nineteenth-century auction results of Mireur (1911-1912), did not yield additional transactions that are records according to the criteria spelled out before.

For the period since the publication of Reitlinger's volume, our starting point is the online database Blouin Art Sales Index (BASI). We convert all prices to GBP and add the buyer's premium whenever necessary. One additional record-breaking post-1960 transaction not included in BASI, the 1961 sale of Rembrandt's "Aristotle contemplating the bust of Homer", was identified based on a review of press articles on auction price records.

The above-described procedure results in a database of 35 art auction records between 1701 and 2014. Table 1 shows for each record the date of sale, the price in British pounds, the name of the artist, the title of the work, and the location of sale. As also illustrated by Figure 1—which shows the timing of records, together with an aggregate art price index from Goetzmann, Renneboog, and Spaenjers (2011) and a number of macro-economic data series—records have mainly been clustered in three periods: the early 1800s, the 1910s and 1920s, and post-1950.

[Insert Table 1 and Figure 1 about here]

V.2. Caveats

We need to stress that our list should not be considered as “the” list of records, but as “a” list of records, for three reasons. First, we believe that the criteria we used to identify records are sensible and defensible, but they are not without impact on the list. We can give many examples. If we had taken a USD rather than GBP perspective, there would have been no 1984 Raphael and 2002 Rubens records; by contrast, our list would have included a 1986 Manet record. A focus on deflated rather than nominal prices would have implied a shorter list. Because we only consider one artwork per auction, there are no 1958 Manet and Van Gogh records on our record. If we had focused on hammer prices rather than prices inclusive of transaction costs, a 1913 Romney record would have to be added and a 1980 Van Gogh dropped from our list. Second, it is not impossible—it is even probable—that we have missed a record-breaking auction. For example, Mühsam (1925) mentions an 1872 sale of a Van Dyck painting in London for 37,800 GBP. That sale would be a record, but we could not find any evidence of the auction in other data sources. More generally, for the first 250 years of our time frame, we need to base our analysis on a selective reading—it is practically infeasible to review all sales in all books covering the history of the art market—of the data that have survived. Third, there are a few items that may not entirely follow our own criteria. For example, it is unclear whether the 1804 Dou record should be considered as a buy-in, as “experts” involved in the sale pushed up the price and the work was eventually purchased by the auctioneer. Also the 1811 Rembrandt sale is suspect, as Smith (1829-1842) notes that the price was run up by the previous owner who had before the auction agreed to sell it privately to “His Majesty”.

V.3. Art Auction Records 1701-2014

For all transactions listed in Table 1, we collect as much information as possible on the identity of the seller and the circumstances of the sale, the identity of the buyer (and other bidders), the characteristics and the history of ownership of the artwork, and the organization of the sale by the auction house. Sources that we consult include auction catalogues, notes on the transactions in the Getty Provenance Index and the different art market reference works mentioned before, books on the history of the art market, press articles and academic texts covering the record sales, and entries on the artworks in Wikipedia and on museum websites. We briefly describe the chronology of our list here, but a full description of all works is of course beyond the scope of this paper.

The list starts with a string of eight records set between 1701 and 1811 by three seventeenth-century Dutch and Flemish masters: Gerard Dou (four times), Anthony Van Dyck (twice), and Rembrandt (twice). The high prices paid for Dou may nowadays be a surprise to many, but Reitlinger (1961) notes that “in 1771 a Gerard Dou was about the most expensive thing you could buy”. According to Smith (1829-1842), Dou’s “Picture in three wings” that set a record in 1771 is the same work as the “Interior with woman and child” that is the first entry on our list. At the 1771 sale, the work was bought by an agent of Catherine the Great, but the ship that transported it sank on the way to Russia. Also the two Van Dyck sales of “Rest on the flight into Egypt” in 1713 and 1733 refer to one and the same painting. In the 1713, it was the first lot in the sale of the collection of William III of England, who had died in 1702 (Jonckheere, 2004). At the 1733 sale, it was bought for Sir Robert Walpole, but it would later move to Catherine the Great’s collection. The 1808 Dou record is the last transaction in the Netherlands on our list. The next entry, the sale of Rembrandt’s “Shipwright and his wife” in 1811 is the first of many record transactions at either Christie’s or Sotheby’s.

After 1811, our list shows a gap of more than four decades. In 1852, a painting by Murillo on the “Immaculate conception” was auctioned off as part of the estate sale of one of Napoleon’s commanders, Marshal Soult, who had “compiled” an impressive art collection during the invasion of Spain. The work triggered a bidding war between the Louvre, the National Gallery, and the Tsar of Russia, and was ultimately auctioned off to the Louvre for 24,600 GPB, more than four times the price paid for Rembrandt’s “Shipwright and his wife”. (The painting has later been donated back to Spain.)

It took almost sixty years before the record set by the Murillo was broken. In 1910, art dealer Joseph Duveen bought “An old woman” by Frans Hals at auction in New York—the first record sale in the U.S.—for the equivalent of 28,250 GBP (and resold it to Henry Frick for 31,000 GBP). The transaction was quickly followed by more Old Master record transactions. In 1912, a Mantegna painting was sold in Berlin for 29,500 GBP, and in 1913 Duveen paid 44,000 GBP for a Rembrandt in Paris. Both paintings were resold to Benjamin Altman. New records continued to be set after the end of the first World War, but the works looked entirely different. In 1919 and 1926, George Romney and Sir Thomas Lawrence became the most expensive artists ever, with their late-eighteenth-century portraits of girls and women.

Only in 1957 did an auction price eclipse the 77,700 GBP paid for Lawrence's "Pinkie" in 1926. A still-life with apples by Gauguin was sold for 104,630 GBP at auction in Paris. In 1958, the Cezanne painting "Garcon au gilet rouge" was sold for more than double the previous record price. The work was the sixth lot in an auction of seven modern masterpieces; lots three (Manet) and four (Van Gogh) had already broken the Gauguin record. Yet, the record price was quickly exceeded by the sum paid for Rubens in 1959, and then for Rembrandt in 1961. The 817,052 GBP paid for Rembrandt's "Aristotle contemplating the bust of Homer" in 1961 was more than three times more than the 275,000 GBP paid for Rubens two years before. In turn, the Rembrandt record was shattered in 1970, when 2.3 million GBP was paid for a Velasquez portrait. Both the Rembrandt and the Velasquez were acquired by the Metropolitan Museum.

In the 11 years from 1980 until 1990, our list shows nine records, which is as much as over the first two centuries of our sample. Of course, the art market boom in this period is well-known. The record went from 2.5 million GBP for one Van Gogh ("Le jardin du poete, Arles") in 1980 to 49 million GBP for another one ("Portrait du Dr. Gachet") in 1990. Two other Van Gogh paintings set records in between. In March 1987, almost 25 million GBP was paid for a painting from Van Gogh's Sunflower series—more than three times the 8.1 million GBP price tag associated with Mantegna's "Adoration of the Magi" in 1985—and less than eight months later "Irises" raised 30.3 million GBP. Apart from the Van Goghs and the Mantegna, we also see record prices for works by J.M.W. Turner in 1980 and 1984, for a Raphael in 1984—the only drawing on our list—and for a Picasso in Paris in 1989. Although the sale of Picasso's "Les Noces de Pierrette" was held in Paris, the auction house published a bilingual French-Japanese sale catalogue, held an exhibition of the work in Tokyo a few weeks before the sale, and organized a video satellite connection with the Japanese capital during the auction. It was the first record sale outside the main auction rooms of Sotheby's or Christie's in more than four decades.

In the early 2000s, the record set in 1990 by Van Gogh's portrait of his doctor was broken first by a large-scale Rubens masterpiece, and then by Picasso's "Garçon à la pipe". In 2010, Giacometti's "L'homme qui marche I" was the first and only statue to become the record holder, but it quickly yielded its position to another Picasso, "Nude, green leaves, and bust". A version of Munch's iconic "The scream" sold for 74 million GBP in 2012. But in 2013, Acquavella Gallery, bidding on behalf of an unknown client, paid 89.4 million for Bacon's triple portrait of Lucian Freud—in June 2014 still the most expensive piece of art ever to be sold at auction worldwide.

VI. Understanding (Record) Art Prices

Our record series reinforces previous findings on the relation between macro-economic trends on the one hand and art prices on the other. For example, Figure 1 suggests that sharply decreasing wealth inequality (and trade openness) in the U.K. and the U.S. can help explaining the lack of records between 1926 and 1957, and that the fast succession of records over the last three-four decades is related to the strong growth in wealth worldwide. However, the records also illustrate the problem with a pure macro perspective. Even adjusting for the changes in taste through time, we see a decoupling of price from quality at the boundary. The record-breaking works are for the most part not regarded as the masterworks of the artists who created them, and in a few cases maybe not even as works of artists generally considered as "masters". Moreover, record transactions do not always coincide with periods of price increases, and vice versa we have often observed long periods of (average) price increases without seeing records (e.g., the second half of the nineteenth century).

We conjecture that auction price records are often set in situations characterized by one or more of the following elements: (i) extreme supply constraints, (ii) instances of social competition among "nouveaux riches", (iii) resolution of uncertainty about the potential resale value of the artwork, and (iv) idiosyncratic shifts from hedonic weights. In the following paragraphs, we will address each of these points, which illustrate the relevance of the micro perspective on art price formation advocated in Section IV.

VI.1. Supply constraints

One recurring feature in our series—especially for records set by Old Masters—is the issue of extreme supply constraints. For example, the increasingly tiny supply of high-quality Raphael works surely contributed to the record price paid for a Raphael study in black chalk—according to the catalogue entry "an auxiliary cartoon"—in 1984. A year later, a news report on the acquisition of Mantegna's "Adoration of the Magi" said that "Mantegna paintings are rare, and very few are left in private hands" (Los Angeles Times, 1985). Until three years before its record sale in 2004, Rubens' "Massacre of the innocents" was considered to be by one of his assistants or followers; the re-attribution turned it into one of the very few large-scale paintings not yet in museums.

VI.2. New wealth and the establishment of social recognition

The changes in the type of purchasers of our record pieces are informative. In the eighteenth and nineteenth century the buyers were mainly European monarchs and rulers. In the early twentieth century we only see purchases by—or on behalf of—wealthy American businessmen: Henry Frick, Benjamin Altman, Andrew Mellon, and Henry Huntington. These acquisitions were part of "America's raid on Europe's great pictures" (Saltzman, 2009); art dealer Joseph Duveen famously commented that "Europe has a great deal of art, and America has a great deal of money". Much of this wealth had been created relatively recently. After the Second World War, the population of buyers internationalizes, in line with changing wealth patterns, but continues to consist mainly of bankers, industrialists, etc. The strong Japanese demand in the late 1980s that followed the country's economic boom also manifests itself in our record series: Japanese buyers were behind three of the four record purchases between 1987 and 1990.

Apart from the importance of new money itself, our record series also clearly illustrates the role of social competition—often among "nouveaux riches"—in the determination of art prices at auction. Indeed, some of the record prices materialized after a fierce bidding war between different parties. We give a few examples. The Louvre, the National Gallery, and the Tsar of Russia fought for Murillo's "Immaculate conception" (1852). Jouin (1895) describes the sale as follows: "The greatest nations were represented with their rival gold, and loud applause accompanied each royal bid. When, for the sum of 615,300 francs, it was knocked down—'To France, gentlemen!' cried the Count de Nieuwerkerke—then broke forth the delirium of a battle won." Before the 1910 sale of Frans Hals' portrait of an old woman, art dealer Knoedler had vowed not to let his rival Duveen "get this picture at any price within reason" (Saltzman, 2009). Hook (2009) writes that Greek ship owners competed for Gauguin's "Apples" (1957).

Social competition can also explain some of the clustering of records that we observe: it is well known, for example, that in the early twentieth century many Americans were competing for similar-looking works. For example, after a (private-market record) purchase of a Rembrandt by Peter Widener in 1911, Benjamin Altman "informed Henry Duveen that he required his own

Rembrandt" (Saltzman, 2009). Duveen would pay an auction record price buying a Rembrandt for Altman in 1913. Similarly, Secrest (2004) reports on the competition between Andrew Mellon and Henry Huntington for Romney and Lawrence portraits—leading to auction record prices in 1926.

VI.3. Resolution of uncertainty about the resale value

Our record series includes a number of works of which multiple versions or editions exist, and that can thus not necessarily be described as "unique". For example, Vincent Van Gogh did a whole series of sunflower paintings; by the time of the 1987 sale of one of them, other versions were in the National Gallery in London, the Museum of Art in Philadelphia, and the Rijksmuseum in Amsterdam. Similarly, different versions of Giacometti's record-breaking statue or Munch's "The scream" exist, but most or all are in museums, validating the importance of the work for sale. For such works, prices may be especially high because there is little uncertainty about the existing preferences for the work—and therefore about the resale potential.

Also the frequent succession of records by the same artist in short time periods can be linked not only to idiosyncratic changes in the demand for "consumption" of the artist's work but also to the idea of resolution of uncertainty about the resale value. In such a view, the increased propensity of art owners to sell after increases in price levels could have contributed to the clustering of records—both on a market-wide and on an artist-specific level—over time.

VI.4. Idiosyncratic shifts from hedonic weights

Even taking into account the above factors, it is difficult to comprehend record prices for a study in black chalk (Raphael), for a Giacometti statue of which six editions and four artist proofs exist (and that realized a price about four times the pre-sale estimate), or for George Romney and Thomas Lawrence portraits, without relying on idiosyncratic shifts from hedonic preferences. Clearly, hedonic models only capture "average" preferences as shown by all available historical transactions, and deviations from these average correlations between artwork characteristics and prices can be important in practice.

VII. Art Price Records and the Industrial Organization of the Art Market

Ashenfelter and Graddy (2003) argued that "the auction institution itself, with commissions, experts, pre-sale estimates, reserve prices, and sequential sales, can have a profound influence on the price of art". Our study of record-breaking auction also highlights the importance of developments in the industrial organization of the art market for long-term price trends. First, the structure of auction houses' transaction fees—commissions charged to sellers and premiums charged to buyers—has changed over time. We already said before that a focus on hammer prices would have yielded a shorter lists, which is in line with recent evidence that bidders capitalize buyers' premia into their bids (Marks, 2009), even if it is still unclear to which extent bidders take into account the impact of transaction costs on potential resale revenues. Second, auction houses started offering credit to potential buyers in the 1980s—a controversial move at the time (Lacey, 1998) that may have pushed up prices. In 1987, Sotheby's financed half of Australian industrialist Alan Bond's record purchase of Vincent van Gogh's "Irises", with the painting itself as collateral. Bond was not able to repay the loan, and in 1990 sold the piece to the Getty museum in deal also involving Sotheby's. (Recently, auction houses have also guaranteed minimum prices to sellers of many high-end works, which may again affect bidders' willingness to pay (Graddy and Hamilton, 2013).) Third, a more general issue is that only over the last half century the auction market has become a retail market. Before that, auctions were mainly a wholesale trading place, and much higher prices were occasionally recorded in the transactions of dealers (who may or may not have bought at auction). For example, some of the private market prices mentioned in Saltzman (2009) for the early twentieth century far exceed the auction records of around the same period. This also implies that very-long-term trends in *auction* prices may slightly overestimate the increase in the willingness to pay for art over time.

VIII. Conclusion

Aggregate art price patterns mask a lot of underlying variation—both in the time series and in the cross-section. We argue that, to increase our understanding of the market for aesthetics, it is helpful to take a micro perspective on the formation of art prices, and acknowledge that each artwork gives rise to a market for trading in its private-value benefits. We discuss relevant recent literature, and illustrate the potential of this approach through a historical study of art price records between 1701 and 2014. Our newly constructed series also points to the importance of developments in the industrial organization of the art market for long-term price trends.

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Table 1: Art Auction Records 1701-2014

Table 1 shows the art auctions records identified in this paper. For each record transaction, the table gives the date of sale, price including buyer's premium, artist name, title of the work, and location (and auction house, if applicable) of the sale.

Date	Price in GBP	Artist	Title	Auction house, location
20/04/1701	**320**	Dou	Interior with woman and child	Amsterdam
26/07/1713	**1,095**	Van Dyck	Rest on the flight into Egypt	Amsterdam
07/10/1733	**1,105**	Van Dyck	Rest on the flight into Egypt	Rotterdam
31/07/1771	**1,410**	Dou	Picture in three wings, forming a triptych	Amsterdam
19/05/1798	**1,522**	Rembrandt	The centurion	Coxe, Burrell, and Foster, London
15/11/1804	**1,680**	Dou	Hermit in a cave	Paillet and Delaroche, Paris
06/06/1808	**1,750**	Dou	The evening class	Rotterdam
12/06/1811	**5,250**	Rembrandt	Shipwright and his wife	Christie's, London
19/05/1852	**24,600**	Murillo	Immaculate conception	Paris
07/04/1910	**28,250**	Hals	An old woman	American Art Association, New York
20/02/1912	**29,500**	Mantegna	Holy family enthroned	Lepke's, Berlin
09/06/1913	**44,000**	Rembrandt	David and Batsheba	Galerie Georges Petit, Paris
06/11/1919	**54,600**	Romney	The Misses Beckford	Christie's, London
28/07/1926	**60,900**	Romney	Mrs. Davenport	Christie's, London
24/11/1926	**77,700**	Lawrence	Pinkie	Hampton's, London
14/06/1957	**104,630**	Gauguin	Apples	Galerie Charpentier, Paris
15/10/1958	**220,000**	Cezanne	Garcon au gilet rouge	Sotheby's, London
24/06/1959	**275,000**	Rubens	The adoration of the magi	Sotheby's, London
15/11/1961	**817,052**	Rembrandt	Aristotle contemplating the bust of Homer	Parke-Bernet, New York
27/11/1970	**2,310,000**	Velasquez	Portrait of Juan de Pareja	Christie's, London
13/05/1980	**2,507,013**	Van Gogh	Le jardin du poete, Arles	Christie's, New York
29/05/1980	**2,997,403**	Turner	Juliet and her nurse	Sotheby's, New York
03/07/1984	**3,564,000**	Raphael	Study of a man's head and hand	Christie's, London
05/07/1984	**7,370,000**	Turner	Seascape, Folkestone	Sotheby's, London
18/04/1985	**8,100,000**	Mantegna	Adoration of the magi	Christie's, London
30/03/1987	**24,750,000**	Van Gogh	Sunflowers	Christie's, London
11/11/1987	**30,280,899**	Van Gogh	Irises	Sotheby's, New York
30/11/1989	**32,934,977**	Picasso	Les noces de Pierrette	Binoche et Godeau, Paris
15/05/1990	**49,121,762**	Van Gogh	Portrait du Dr. Gachet	Christie's, New York
10/07/2002	**49,506,650**	Rubens	Massacre of the innocents	Sotheby's, London
05/05/2004	**58,223,688**	Picasso	Garcon a la pipe	Sotheby's, New York
03/02/2010	**65,001,250**	Giacometti	L'homme qui marche I	Sotheby's, London
04/05/2010	**70,452,891**	Picasso	Nude, green leaves, and bust	Christie's, New York
02/05/2012	**74,003,394**	Munch	The scream	Sotheby's, New York
12/11/2013	**89,411,063**	Bacon	Three studies of Lucian Freud	Christie's, New York

Figure 1: Art Auction Records and the Macro-Economy 1700-2014

The vertical lines in Figure 1 show the timing of art auctions records over the period 1700-2014. Figure 1 also shows the record price level, an aggregate art price index, and a U.K. equity price index, in deflated GBP terms, against the left axis, and U.K. inflation, the share of wealth held by the top percentile in the U.K., and a measure of openness to trade, in percentage terms, against the right axis. Data on CPI come from MeasuringWorth.com. The art price index comes from Goetzmann, Renneboog, and Spaenjers (2011). Data on equities come from Global Financial Data and Dimson, Marsh, and Staunton (2002, 2013). Wealth share data come from Ohlsson, Roine, and Waldenström (2008) and Piketty (2013). Data on exports, imports, and GDP come from Hills, Thomas, and Dimsdale (2010).