



ART AUCTIONS AND ART INVESTMENT IN THE GOLDEN AGE OF BRITISH PAINTING

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ABSTRACT

We analyse the evolution of the price of paintings in London auctions with a unique data set of over 200,000 sales in the period 1780–1840. We build a price index for the representative painting through hedonic regressions controlling for the characteristics of auctions and paintings and for the artists' fixed effects. The emergence of an efficient secondary art market was an important opportunity for portfolio diversification. Estimating a CAPM model for art investment suggests that British paintings could deliver a higher return compared to imported paintings and an attractive source of diversification relative to the contemporary stock market. This contributed to increase the demand for British art and, possibly, to promote the innovations of its Golden Age. While the representative painting of the British school was initially undervalued, new British painters reached foreign prices by the beginning of 1800s.

The Arts will always flourish in Proportion to the patronage given them by the Rich, Joseph Banks

We examine the market for paintings in London between the end of the 1700s and the beginning of the 1800s through the analysis of art auctions of this period.¹ The econometric analysis of a unique data set, which is larger than any data set on historical art prices used before, allows us to investigate art pricing in the secondary market, build an accurate hedonic price index² and provide some preliminary considerations on the economic determinants of art pricing³ and art investment.⁴

Probably for the first time in art history, the development of an efficient auction market in a vital financial centre such as London did turn art

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¹ For a recent art historical review of British art in this period, see Solkin (2015).

² For an alternative price index, see the recent work by Spaenjers *et al.* (2015). Related applications of quantitative methods to the economics of art can be found in Graddy and Pownall (2016) and Goetzmann *et al.* (2016).

³ While most of the work is empirical, for a recent theory of art pricing, see Itaya and Ursprung (2016).

⁴ The financial analysis of investment in art was started by Stein (1977) and Baumol (1986). See Agnello (2016) for a recent application.

investment into a financial opportunity. In particular, we argue that British paintings were initially undervalued but could guarantee a higher return compared to imported paintings and an attractive source of diversification relative to the contemporary stock market. The increase in demand and price of British art may have played an important role in fostering the artistic innovations of the British Golden Age.⁵

Our work is related to a growing body of literature on historical art markets emphasizing the economic determinants of artistic production and innovation. Since the pioneering work of Montias (1982), interdisciplinary research in economic history and cultural economics, has been focused on the organization of artistic markets in Italy (for instance, see Spear and Sohm, 2010; Etro and Pagani, 2012 2013; Pinchera, 2014; Etro *et al.*, 2015; Borowiecki, 2015), the Netherlands (Montias, 1996; De Marchi and Van Miegroet, 1994; Montias, 2002; Etro and Stepanova, 2016), Spain (Etro and Stepanova, 2017), England (Cowan, 2006; Bayer and Page, 2011) and France (Etro and Stepanova, 2015). These studies have pointed out a number of interesting stylized facts and have provided descriptive statistics on the paintings traded by painters, owned by collectors or traded in auctions between the XVII and XIX century.⁶ However, most of them are based on limited data sets with few hundreds or, at most, few thousands of observations on art prices, which can be hardly representative of the entire trade in art at the time.

In this work, we focus on London auctions with a unique data set from the Getty Research Institute with over 200,000 transactions. The period under consideration, between 1780 and 1840, became to be known as the Golden Age of British paintings (see Vaughan, 1999, Solkin, 2015). This coincided, not by chance, with an innovative age characterized by an unprecedented development of the financial markets in London, a rapid accumulation of capital in the country made possible through international trade, and the development of technological innovations at the basis of the First Industrial Revolution.

Our data set contains all the paintings traded at any price in any available auction house during the period. An important related work by Bayer and Page (2011) has analysed paintings traded at extremely high prices (above 100 pounds) between 1740 and 1909, and all the paintings traded at Christie's in the period 1840–1885. Therefore, it is a representative sample only for a later period, and mainly for the major auction house. Besides these substantial differences in data sets, Bayer and Page (2011) focus on other research questions and provide interesting evidence on the mixed social origins of sellers and buyers active in the auctions. A result of their empirical investigation is that British paintings were sold at prices that were significantly lower than the

⁵ Our considerations based on the analysis of the British market for paintings should be seen as complementary to art historical considerations. However, prominent art historians like Solkin (1996) have already emphasized the importance of the market environment for the development of the British school. See also Hamilton (2014).

⁶ The economics of Renaissance art in Italy between the XIV century and the XVI century is studied in Etro (2016).

imported paintings. Moreover, they have shown smoothed average prices emphasizing an increasing trend in art prices during the Victorian age.⁷ We complement this work with a fully fledged econometric analysis.

We confirm that prices of British paintings remained on average well below the prices of imported paintings, but tended to increase more over time. We start by running hedonic regressions that emphasize the determinants of art pricing and we compute through them hedonic price indexes for all the paintings and for those of different national schools. This allows us to obtain annual return rates for the investment in paintings in general as well as in paintings of different national schools. In particular, we obtain an average return rate of 4.3% for art investment, but the return for investment in the British school is both higher (7.2%) and riskier compared to investment in other schools. Applying a basic CAPM methodology on return/risk of the stock market and the art market (see Stein, 1977, and Agnello, 2016), we show that investment in British art was an attractive investment option also in terms of portfolio diversification, while the aesthetic dividend from owning paintings was higher for Italian and Dutch works compared to the British ones. While only suggestive, because of the limited data on the stock market of the period, these results are in line with the fact that British collectors did value foreign paintings more but they started to invest in the undervalued British paintings to look for better returns and diversify their investments.

This may have been a key factor driving the increasing demand for domestic art also in the local primary market, which in turn did foster innovative artistic activity. We support this Schumpeterian thesis by showing that the faster appreciation of British paintings was largely due to the new painters. Indeed, the prices of the new British painters entering in the market during the 1700s did increase relatively to the others, reaching the same levels of the imported paintings for the local artists that started their activity at the end of the century. Painters of the British Golden Age such as Lawrence, Reynolds, Wilkie and Turner finally reached the same prices, as well as the same international recognition, of the best contemporary continental masters.

The article is organized as follows. Section I describes the development of the art market in London in detail setting the stage for the subsequent economic analysis. Section II focuses on the auction market and describes the data set based on auctions' results. Section III presents the econometric analysis, estimates a simple CAPM model to investigate whether investment in British art was attractive and provides evidence that increasing prices of the new domestic painters were driving the higher returns of the British school. Section IV concludes.

⁷ More interestingly, Bayer and Page (2011) present a repeated sale price index for the period 1840–1900 which shows a rapid increase in the price of representative paintings. Since we focus on the earlier period 1780–1840, our work can be seen as complementary to theirs.

I THE DEVELOPMENT OF THE BRITISH MARKET FOR PAINTINGS

Since Medieval time, the supply of paintings in the British isles has been confined to a marginal production of decorative paintings, including heraldic signs, coach decorations, theatrical scenery and furniture elements. Art historians (for instance Gombrich, 1995) have often associated the prolonged artistic backwardness of England with the influence of the Anglican Church, which banished commissions of figurative paintings from religious institutions. Such an explanation, however, is not sufficient because private commissions may have replaced public ones, possibly with a bias toward non-figurative paintings (as it happened in the Netherlands). Instead, the main British collectors imported most of their high-quality paintings from the more advanced Italian and Flemish markets.

The Worshipful Company of Painter-Stainers, which originated from a medieval guild to regulate the craft of painting, tried to set limitations on the imports of artworks at least since the XV century (with laws of 1463 and 1483), but there is no evidence that this ban was effective before its explicit abolition in 1695 (Ormrod, 1998). Even import tariffs had a limited impact on the trade of paintings. Initially they were *ad valorem*, increasing from 20% to 60% at the end of the XVII century, but they could be easily evaded by declaring a low value for the imported paintings. As a consequence, specific tariffs based on the size of paintings were introduced later on,⁸ although their impact was mainly to select the import of paintings of higher value. Indeed, the high-segment of the British art market was dominated for centuries by imports of continental works, often acquired during the *Grand Tour* of the British aristocrats, as well as by the production of immigrant artists.⁹ Many of them were established masters who moved to England to work for the Crown, as in the well-known cases of Hans Holbein during the XVI century or Anthony Van Dyck, Orazio Gentileschi, Antonio Verrio or Willem van de Velde (both the Elder and the Younger) during the XVII century.¹⁰ England was accumulating a substantial stock of imported paintings without developing a real primary or secondary art market.¹¹

The need of pictures for home decoration started to emerge slowly during the XVII century, as documented by the presence of cheap paintings and prints in

⁸ Since 1721 duties of 1, 2 or 3 pounds were applied respectively to paintings smaller than 2 feet square, up to 4 feet square and above this threshold. Additional 5% *ad valorem* tariffs were introduced in 1747 and 1759 (Ormrod, 1998, p. 171).

⁹ Bayer and Page (2011, p. 17) notice that 300/500 paintings were probably imported annually in the last forty years of the 1600s and during the same period more than a hundred Dutch painters visited England.

¹⁰ After moving to the Court of Charles I in 1632, Van Dyck obtained a knighthood, the title of principal painter in ordinary to the King, the yearly pension of 200 pounds and a house. Antonio Verrio painted twenty ceilings and three staircases at Windsor, the King's Chapel and St. George's Hall, receiving the huge payment of 7945 pounds, and later the Heaven Room at Bourghley House for £ 500. He also obtained the royal pension of £ 200.

¹¹ Also in the case of prints, England will remain a net importer until the 1780s, when it will start to export prints especially to France. The only significant exports of paintings, instead, will be destined to the colonies, especially Jamaica, New York and Pennsylvania (Pears, 1988, p. 57).

inventories of middle-class London houses between 1693 and 1713 (Gibson-Wood, 2002). Nevertheless, the demand for works of minor genres was largely satisfied by Dutch paintings: in economic terms, England had not a comparative advantage in the painting sector (Ricardo, 1821). Immigrant Dutch painters arrived in dozens at the turn of the century. In the absence of effective competition from local painters, they could command high prices, as the documented 70 pounds that Simon Verelst was asking for his still-life paintings in 1669, apparently becoming the best paid painter in town (Solkin, 2015, p. 22). All of this is suggestive of a typical phenomenon emerging in a sector characterized by external economies of scale and a learning curve (Graham, 1923). The continental art markets, especially the Dutch and Flemish ones, had developed (over centuries) sufficient production externalities to supply paintings with a quality-price ratio that the British art sector could not match in a free market (except possibly for the portraits, where local demand could allow for the accumulation of some production externalities).¹² Accordingly, the domestic production of paintings could not start exploiting its learning curve as long as the foreign supply was better serving the scarce domestic demand. Still in the first half of the XVIII century, the demand for artistic decorations was largely satisfied by imported paintings¹³ and by many immigrant painters, including top Venetian painters such as Antonio Pellegrini, Sebastiano Ricci and even Canaletto.¹⁴ Domestic demand was rapidly raising during this age of increasing prosperity of the middle class. Meanwhile, the new imports of foreign paintings started to adversely affect quality, and a new production of home forgeries of old master paintings emerged and prospered. Also as a result of this, demand finally began to turn toward the domestic production during the mid XVIII century (see Solkin, 1996; Bayer and Page, 2011).

The development of a British school during the 1700s was gradual and associated with a dynamic economic environment that could stimulate and reward innovations (Pears, 1988). One of the first prestigious commissions of figurative paintings for a British painter was assigned in 1715 through an open competition for the decoration of the dome of the St. Paul's Cathedral, when James Thornhill won over foreign masters such as Pellegrini, Ricci and others. Most developments, however, took place in minor genres: the father of the British school, William Hogarth, introduced *conversation pieces* and a new

¹² Nevertheless, in the 1730s a French art critic, Jean-Bernard Le Blanc, was still judging the quality of British portraits in the following terms: 'The portrait-painters are at this day more numerous and worse in London than ever they have been ... I have been to see the most noted of them; at some distance one might easily mistake a dozen of their portraits for twelve copies of the same original. Some have the head turned to the left, others to the right: and this is the most sensible difference to be observed between them. Moreover, excepting the face, you find in all the same neck, the same arms, the same flesh, the same attitude ... Properly speaking, they are not painters: they know how to lay colours on the canvas, but they know not how to animate it.' (see Solkin, 2015, p. 125).

¹³ The annual average number of imported pictures in London during the 1760s reached 880 according to Ormrod (2002).

¹⁴ In the case of Canaletto, the specific purpose was circumventing the English dealer Joseph Smith, who had moved to Venice to intermediate Canaletto's *vedute* for British collectors with huge markups. Canaletto organized two personal exhibitions in London, one in 1749 and another in 1751, and then preferred to move back to Venice.

version of genre paintings, characterized by satirical and moral illustrations, and started monetizing his efforts by selling prints after his paintings. The success of his set of engravings 'A Harlot's Progress' (1732), reaching 1240 subscribers at one guinea each, resulted in pirated reproductions by unscrupulous print sellers.¹⁵ As a consequence, before issuing a second set of prints ('A Rake's Progress'), Hogarth lobbied the Parliament to obtain the Engravers' Copyright Act, also known as the Hogarth's Act (1735), which was the first copyright law for art and launched a florid market for prints. Hogarth exploited the new IPR protection by accelerating his production (dispensing with preparatory painting) and expanding his subjects to the life of the lower class,¹⁶ while other painters did so by quickly preparing and advertising prints for new novels, as Francis Hayman and Joseph Highmore did for Samuel Richardson's *Pamela*.

The first genre in which England and Scotland (as well as Ireland) started to develop artistic capabilities was portraiture, with early masters such as Peter Lely and Godfrey Kneller emerging in the middle of the XVII century,¹⁷ and a wide number of minor artists specialized in portraits. During the first half of the XVIII century portraiture, usually priced by size or by number of figures, kept being well remunerated and started to attract new talents: in the 1730s Jonathan Richardson 'was in a position to demand 70 guineas for a full-length, but only 20 guineas for a "three-quarters" (also called a bust-length or a head-and-shoulders)' according to Solkin (2015, p. 86). The most ambitious painters, such as Knapton, Ramsay and Reynolds, travelled to Italy to learn the classic style and went back to London ready to conquer such a lucrative business. Joshua Reynolds became the most celebrated between them, and exploited this expanding sector with an accurate activity of marketing. As Vaughan (1999, p. 82) notices, 'he was assiduous in having engravings made of his pictures for wider circulation. When Lawrence Sterne shot to fame with the publication of *Tristan Shandy* in 1760, Reynolds painted his portrait and had it engraved, achieving great profit'. By the second half of the 1700s portrait commissions were more profitable in London than anywhere else: 'a typical price in the 1750s in a successful London practice was 24 guineas for a half-length and 48 guineas for a full-length ... Top of the league was Reynolds, who at the height of his success demanded 200 guineas for a

¹⁵ For future reference, a gold guinea was worth 21 shillings, and a pound was worth 20 shillings.

¹⁶ Solkin (2015 p. 109) emphasizes that 'the reduced investment of time and money made it possible for the artist to sell each series upon its publication – that is to say, without soliciting for subscriptions in advance – and to charge considerably less for them than for any of his previous sets of prints. One important consequence of this novel marketing strategy was to make it possible to imagine that these Modern Moral Subjects could be bought by the same lower classes of society who were depicted in the scenes themselves'.

¹⁷ Lely reached wealth and royal recognition, with an annual pension of £ 200 awarded as the heir of van Dyck. Kneller went further: as Solkin (2015, p. 42) notices, 'no other painter in British history has ever monopolized the production of official portraits of the sovereign to so great an extent or for so long. Selling countless copies to the government at £ 50 a time made Kneller an extremely rich man'. However, he could make more money in the private market, where he was charging £ 66 for a full-length portrait.

full-length and 100 for half-length. These prices were substantial even within Britain' (Vaughan, 1999, pp. 42–43).¹⁸ In this environment, other talented portraitists flourished, such as Thomas Gainsborough, George Romney and the Scottish masters Henry Raeburn and Allan Ramsay.

The development of a British school of historical paintings was slow, at first stimulated by public commissions for charity institutions (such as the paintings for the Court Room of the Foundling Hospital, whose Governor was Hogarth), which contributed to support a new ethical mission for painting, aimed at cultivating social virtues, as claimed by the philosopher Shaftesbury. This principle was even formalized in the *Treatise on Ancient Painting* by George Turnbull (1740), although Bernard de Mandeville criticized it in his *Fable of the Bees* (1723) claiming that private vices, in particular the consumption of luxury goods like paintings (independently from their subjects), do sustain a civilized and enriching society. The arguments of the Scottish economists on the invisible hand of free markets will soon follow in Adam Smith's *Wealth of Nations* (Smith, 1776), written right at the beginning of the period under our consideration.

The emergence of places where paintings could be exhibited in public paid a key role in fostering the demand for art. Exhibitions could take place in the famous Spring Gardens at Vauxhall (opened in 1732 and decorated with paintings by Hogarth and Hayman) or in showrooms as the one of the auctioneer Christopher Cock, and it was in these locations that a large and heterogenous public could be reached for the first time.¹⁹ The role of *clubs* and even *coffeehouses* in publicizing art has been equally important and has contributed to the emergence of art criticism as a profession.

The consecration of domestic painting, however, happened in 1760, with the launch of an annual exhibition and a competition for the best painting of a subject from national history, and in 1768 with the foundation of the *Royal Academy of Arts*, consisting of forty members under the direction of Reynolds.²⁰ The main event organized by this institution was the same art exhibition, which between 1780 and 1838 took place in the large rooms prepared at 'Somerset House' in the Strand, selecting works from all genres. In spite of explicit support, the artistic achievements of the figurative genre in the 'gran

¹⁸ In 1754, the Swiss pastellist Liotard managed to be paid 400 guineas for the portraits of the members of the family of the Princess of Wales Augusta.

¹⁹ As Solkin (1996) notices, 'the Gardens provided the most pertinent and readily available model for an economics of art production responsive to the character of the modern public sphere – an economics predicated first and foremost on a need to satisfy the interest of an exceedingly large audience, many of whose members had little understanding of or sympathy for the finer points of connoisseurship. It was people of this sort who streamed in their thousands to the early exhibitions; and while the shows may not have been expressly designed to turn a profit, indirectly at least they were meant to serve a commercial purpose, by cultivating as broad as possible an interest in the visual arts'.

²⁰ Other academies without royal patronage had been founded before, as the *Society of the Virtuosi of St. Luke* established in 1689, the *Great Queen Street Accademy* directed since 1711 by Kneller and since 1716 by Thornhill and re-established as *St Martin's Lane Academy* by Hogarth in 1734. A St. Luke's Academy was also set up in 1729 in Edinburgh, while the Dublin Society was funded in 1731 (Arnold, 1977).

manner' will be limited, except for the notable exceptions of the American painters Benjamin West and John Singleton Copley. West presented his *Death of General Wolfe* at the 1771 exhibition with great success, managing to sell it for a sum between £ 400 and £ 600 and receiving commissions of five more copies, one for King George III. Copley was credited for the first successful one-picture show with his exhibition in the Spring Gardens of the *Death of the late Earl of Chatham* (1781, now in the National Portrait Gallery, London), which attracted over 20,000 visitors. The painter may have got up to £ 5000 in admission fees alone, the double of the market value of the painting, evaluated £ 2625 in 1788 but actually sold in a 1806 lottery for £ 2100. A similar success happened for his huge *Floating Batteries at Gibraltar* (1783–91) for whose commission Copley outbid the rival West accepting a compensation of £ 1000 but recouping the cost of years of work from a private exhibition (with 60,000 visitors) and from the sales of the engravings. These engravings were prepared by John Boydell, an innovative art dealer specialized in the business of commissioning paintings of attractive subjects (for instance a series on Shakespeare's plays) to make profit from the sale of their prints.

Another significant talent as Joseph Wright of Derby exploited the large public of the exhibitions to introduce innovative solutions aimed at representing the new world of 'enlightenment' and technological progress in England (as in the celebrated *Experiment on a Bird in the Air Pump*, 1768, now at the Tate Gallery, London). As Solkin (1996, p. 231) has noticed, 'these pictures were designed with the reproductive print trade in mind. In such circumstances the pressures to succeed demanded a sort of picture which had to appeal to a much larger and socially more heterogeneous audience than Shaftesbury's public of landed gentlemen'. But besides exhibitions, art development needed a stable market where paintings could be priced and traded on an ordinary basis.

II LONDON ART AUCTIONS, CHRISTIE'S AND RECORD SALES

Given the limited role of patronage and traditional commissions in the British primary market, it is not surprising that only the emergence of an efficient anonymous market for art trade could facilitate the development of a domestic production. Auctions had this role. They were first recorded at Somerset House in London in 1674, at least a century later than in the Netherlands (Montias, 2002),²¹ but soon became the leading channel through which paintings were traded in England (Cowan, 2006). In 1689 the auctioneer Edward Millington provided the first regulation for these ascending price auctions (basically the same valid nowadays), with commissions for the auction houses on each sale.²² Auctions were mainly taking place from September to March (when the aristocracy was moving from the countryside to London), in the

²¹ Before that, 'outroeping' (defined as selling by the voice at the highest bidder) and 'sales by candle' were organized under a public monopoly.

²² A later legal case (*Jenwardine vs. Slade*, 1796) will establish another modern principle of auctions, for which an auction house is not responsible for the attributions of the paintings, which should be understood only as personal opinions of its experts.

area around Coven Garden, Charing Cross and the Strand (Gibson-Wood, 2002), and the range of traded items rapidly expanded over time. Their success was rapid in the British society, because participation to these events was associated with what was regarded as a polite display of both wealth and taste, as well as with the inclusion in the elitarian world of *connoisseurship* (Cowan, 2006).²³

The first auctions were organized by small auction houses and by a variety of art dealers. The first documented art dealers were Thomas Manby, James Graham and Andre Hay, who travelled repeatedly to the continent to collect paintings to be sold in London. Robert Bragge was active in the middle of the 1700s organizing many auctions, including the first for which a catalogue has survived (in 1742). He also imported from the French tradition the practice of giving basic information on the paintings. However, contrary to what was happening in Paris during the 1700s, where French art dealers were controlling the market and organizing auctions (see Etro and Stepanova, 2015), British art dealers were mainly traders who participated to auctions organized by independent auction houses.²⁴ By the last quarter of the century, the British auction houses were the primary exchange platforms for major collections arriving from continental Europe, which was often under the threat of political instability and wars. The continuous imports of paintings that needed a secondary market for resale made it possible to create a highly liquid and efficient auction market where artworks of all schools and periods could be traded. This made it possible for the domestic production to expand as well.

We have studied this secondary art market putting together a data set from the Getty Research Institute on auctions taking place between 1780 and 1840. We have data for over 200,000 attributed paintings' sales from 3393 auctions held in London.²⁵ The number of transactions increased rapidly over time: the annual number of auctions in the data set increased from about twenty to almost two hundred, while the average number of lots per auction was stable around eighty paintings. During this period Christie's, founded in 1766, gradually acquired a dominant position in the auction market. Its founder, James Christie, exploited the two-sidedness of the auction platform to reach

²³ As Cowan (2006, p. 163) notices, art 'became a refined and "polite" arena for elite competition for status and for public recognition of that status. The art auction was something like a duel, or a cock-fight, by other means'.

²⁴ Bayer and Page (2011) document that dealers active at auction were mainly sellers up to the beginning of the 1800s and mainly buyers after that (and they were rarely reselling at auction the same paintings). Interestingly, the time of the shift from net sellers to net buyers appear close to the peak in the art price index reported below.

²⁵ Auctions were also held in other towns, and we have data on auctions organized in Liverpool (1300 sales), Bath (900 sales) and Tewkesbury, Norwich and Manchester (each one with about 500 sales). The small number of these sales shows the cultural dominance of London, where most local artists were clustering (see Borowiecki, 2013, for a similar phenomenon for music composers) and led us to exclude them from the analysis for reasons of homogeneity. In the notable case of Manchester, the average price in thirteen auctions was £ 22, above the average price in London, of £ 16. These sales included two works by Joseph Wright, 'A Cavern Scene with a Bridge' and 'The Bridge and Waterfall at Rydal in Westmorland', sold for £ 42 and £ 48 (now at the Derby Museum and Art Gallery) and a Titian sold for £ 770.

dominance: on one side he heavily publicized his auctions attracting many potential buyers and on the other side he managed to conquer important consignments also from abroad, often secured by offering advances and loans. In other words, he subsidized one side of the market (the sellers) to increase the mass of traded paintings while profiting on the other side of the market (the buyers).²⁶ Also because of these aggressive strategies, other auction houses had to discontinue their operations (Cock and Langford in 1776, Walsh in 1777, Greenwood in 1794) and Christies kept gaining market shares over time. Almost half of our observations derive from sales organized by Christie's and 80% from the four main auctions' houses, namely Christie's (47%), Edward Foster (25%), Harry Phillips (8%) and Peter Coxe (2%), while the rest is spread between a hundred small players, one of which was Sotheby's, founded in 1744, but still marginal during our period of observation.²⁷ The dominance of Christie's will be strengthened in the Victorian age, reaching a market share around 90% by the end of the 1800s according to Bayer and Page (2011).

For each auction in the data set, we know the year and the month in which it took place, the organizer and a variety of characteristics of the sales. We restrict the analysis to oil paintings for reasons of homogeneity and because they represent by far the majority of the transactions. For each painting, we have information on the price of sale in British pounds, the name of the artist and objective characteristics already used in earlier investigations, such as the length of the description of the painting (number of letters), the presence of positive comments on its quality²⁸ and sometimes the identity of its previous and subsequent owners, almost always British. In some cases, the painting was bought-in and the price evaluation reflects the reserve price of the seller or the evaluation of the auction organizers.²⁹ Only for a minority of the observations, the support of the painting was reported in the records, and for only ten thousands, we also know the height and length of the paintings, in feet and inches converted into metres. The average surface area is about a square meter, as typical of a production destined for private homes. Table 1 reports the descriptive statistics for the full data set in columns 1–3 and for a reduced one with only paintings whose size is known in column 4–6. The latter represents a more homogeneous group of high-quality paintings (for which additional information, such as surface area, was recorded).

²⁶ This is a typical phenomenon in two-sided markets (Rochet and Tirole, 2003).

²⁷ In spite of the large number of observations, our sample may not be entirely representative for the distribution of auction houses over the years; therefore, we cannot safely infer the evolution of market shares. However, it is well known that Christie's conquered the majority of the auction market by the end of our period of investigation.

²⁸ From this, we build a dummy variable 'Beautiful' present in the regression as a proxy for quality. Unfortunately, we do not have systematic information on the exhibition history of the paintings (on its role in modern auctions see Hellmanzik, 2016). The genre of the paintings is rarely indicated, and we could not recover it in a reliable way from the titles in such a big data set. However, our preliminary investigations on subsamples suggest that genre differentials were negligible after taking into account the standard controls.

²⁹ In many cases, it is not specified whether the painting was sold or bought-in; therefore, in the baseline regressions, we control with dummies for paintings that are sold or bought-in, but in subsequent regressions, we focus on paintings that were explicitly sold.

Table 1
Descriptive statistics

Variable	Full dataset			Reduced dataset		
	Mean	SD	Av. price (pounds)	Mean	SD	Av. price (pounds)
Price (pounds)	16.916	85.895		69.461	178.024	
Size (in metres)				1.037	1.523	
Unknown support	0.969	0.174	15.75	0.608	0.488	67.14
Canvas	0.008	0.088	83.41	0.139	0.346	86.62
Copper	0.009	0.092	16.7	0.03	0.171	53.99
Panel	0.015	0.121	57.48	0.222	0.416	67.14
Copy	0.044	0.204	6.4	0.029	0.168	27.4
Inscribed	0.005	0.069	49.84	0.009	0.093	233.31
Nr paintings sold together	1.089	0.285		1.048	0.213	
Description length	59	96		129	206	
Beautiful	0.032	0.176	79.1	0.095	0.293	172.9
Current place known	0.01	0.102	237.4	0.058	0.234	295.73
Previous owner known	0.032	0.177	121.01	0.114	0.318	209.65
Sale outcome unknown	0.144	0.306	23.78	0.346	0.427	46.08
Bought-in	0.269	0.443	19.59	0.164	0.37	130.49
Sold	0.588	0.492	14.03	0.49	0.5	62.02
January	0.057	0.233	6.39	0.004	0.066	16.67
February	0.097	0.297	12.11	0.072	0.259	38.52
March	0.149	0.356	15.55	0.181	0.385	44.74
April	0.133	0.34	20.52	0.169	0.375	83.11
May	0.182	0.386	25.02	0.299	0.458	92.17
June	0.159	0.366	22.44	0.179	0.383	80.47
July	0.078	0.268	11.86	0.062	0.241	34
August	0.018	0.131	5.46	0.012	0.109	17.54
September	0.008	0.091	4.27	0.004	0.063	11.86
October	0.01	0.097	3.2	0.003	0.056	14.97
November	0.056	0.229	8.9	0.01	0.099	6.82
December	0.053	0.224	11.54	0.005	0.071	12.16

Painters are mostly from the Dutch and Flemish school (36% and 16%), the Italian school (22%), the British school (17%) and the French school (7%) but the absolute and relative frequency of British painters increases over time, which reflects the evolution of the composition of British collections. In particular, the number of observations from the British school doubles in the last two decades of the 1700s and then is constantly in the range of 18–20%, while the number of distinct British artists traded in each year increases four times (from less than thirty to more than a hundred). There are also some early American painters, such as Benjamin West, John Singleton Copley, Mather Brown and Gilbert Stuart. The most common attributions are for works by old masters such as Rubens and Teniers (with more than four thousands observations each), van Dyck, Rembrandt and Titian. The most

frequent British painters are all from the 1700s, as the painter of animals George Moreland (with 2716 sales), and the portraitists Reynolds (1733 sales) and Gainsborough (1194 sales), while the only continental painter from the 1700s whose works could be equally popular in London's auctions was Canaletto (with 1492 attributed sales).

The average price of the domestic works is much lower than the one of imported paintings, with about £ 10 for an average British painting against £ 23 for Italian and French paintings and £ 17 for Dutch paintings. In addition, the best priced paintings are all from the continental schools with more than a hundred paintings sold for more than a thousand pounds and almost five thousand paintings priced above a hundred pounds. The highest recorded evaluation is for a landscape by Poussin, bought in at £ 10,080 in 1822, while the *Portrait of the Shipbuilder Jan Rijcksen and his Wife* by Rembrandt (1633, now in the Buckingham Palace) was sold in 1811 for £ 5250. These were paintings with a reliable attribution, but of course, the majority of continental paintings were sold for much lower prices, in spite of remarkable, and sometimes disputable, attributions. Many of these were only by followers of the master or were copies, if not products of a new increasing phenomenon: home produced forgeries of paintings by old foreign masters (see Zeri, 1990).

The highest prices for British paintings, besides the *Death of the late Earl of Chatham* by John Singleton Copley, were for works by Joshua Reynolds, such as *A rest of the holy family* priced £ 1995 in 1829. Indeed, we know that Reynolds was able to bargain unprecedented prices for his innovative portraits. His *Mrs. Siddons as the tragic muse* had a big impact at the 1784 exhibition, although it was not sold immediately by Reynolds. As Solkin (2015, p. 203) tells us, the painting 'returned to the artist's studio, where it presumably functioned as a "show picture" until 1790, when Reynolds finally found a buyer (the former French Minister of Finance Charles Alexandre de Calonne), who was prepared to meet his huge (and extensively publicized) asking price of 1000 guineas. Few eighteenth-century British painters were more astute market operators'. Our records show that this painting was resold for £ 1,837 in 1823.

Considering the primary role of land and landownership in the British culture, it is normal to find also well paid landscapes in the data set. One of the first successful painters in this genre was Richard Wilson, whose Italianized landscapes were highly regarded as an artistic investment. We know that the prints of his *Destruction of the children of Niobe* (1761) earned £ 2000, an unprecedented profit for prints of a landscape, and one of the replicas of the painting of *Rome from the Villa Madama* (1765), originally executed in his trip to Italy, was sold for 222 guineas. Auction records show that in 1827 *A Grand Landscape view on the Arno* by Wilson was sold by the famous collector John Leicester, Baron de Tabley, for the considerable amount of £ 493. Nevertheless, some later landscapists obtained even greater success.

Joseph William Turner (1775–1851) reached prices comparable with those of the best portrait painters. Already in 1799 he was selling a watercolour of *Caernarvon Castle* for 40 guineas to John Julius Angerstein, whose huge

collection will later form the nucleus of the National Gallery. A year later, he was selling the oil painting *Fifth plague of Egypt* for 150 guineas to the famous collector William Beckford. Turner quickly gained the reputation as a tough bargainer. In 1803 he was asking 300 guineas for the *Festival upon the opening of the vintage of Macon*. According to Hamilton (2014, p. 6), 'Turner was making a calculated move to benchmark his prices in the light of his own assessment of his worth. Sir John Leicester, a landed baronet whose income came from the produce of farms and salt mines in Cheshire, and who had a penchant for buying British art, offered 250 guineas for the *Macon*. Turner refused the offer and held the painting back. The following year Leicester returned to the subject and offered the asking price, but Turner now demanded 400 guineas ... another aristocrat, Lord Yarborough, who owned large swathes of both Lincolnshire and the Isle of Wight, moved in and bought the painting for the original asking price of 300 guineas. Within two years, Leicester had got over that loss by acquiring Turner's *Shipwreck* for 300 guineas ... Turner's behaviour in respect of two powerful men bidding for his favour is a sure sign of artists' growing awareness of their economic power'. For *Dido building Carthage* (1815) Turner refused a thousand guineas offered by the printer Robinson and later on five thousand offered from a group of gentlemen willing to donate that masterpiece to the National Gallery: the painter himself will leave it to the museum together with the *Sun rising through Vapour* on condition that the two paintings would hung always between two pictures by Claude Lorrain, as they still do. Only the late visionary phase of Turner's *oeuvre* lost consensus between collectors, with the notable exception of the art critic John Ruskin, who will also own some of his works (including the *The Slave Ship*, 1840).

John Constable (1776–1837) was not equally successful in his early career. Only in 1819, he sold his first important canvas (*The white horse*) and was elected an Associate of the Royal Academy. However, he was rediscovered in the secondary market, especially when the dealers Arrowsmith and Schroth introduced his works at the Paris Salon of 1824. He sold only 20 paintings in England during his life but more than that in France within few years. And at the end of his life, the prices of his paintings were starting to grow substantially. Our auction data display high prices for both Turner and Constable: *Dutch fishing boats with the sun rising* by Turner was sold for £ 514 (but the buyer was the same Turner trying to protect the value of his paintings) and a *A Waggon passing through a river* by Constable was sold for £ 378.

Minor genres reached high prices only in the early XVIII century in both the primary and secondary market. The Scottish David Wilkie (1785–1841) is a good example for genre paintings, a field in which he obtained a quick leadership with *The village politicians* and *The blind fiddler* presented at the 1806 exhibition and sold for respectively 30 and 50 guineas. These kinds of paintings will feature increasing prices in the secondary market: for instance, our records show *A Rent-Day* by Wilkie to be sold for £ 787 in 1832. The career of Wilkie flourished soon. For the *Letter of introduction*, he was already able to charge 250 guineas in 1813, and *Distraint for Rent* (1815) was purchased

for 600 guineas by the Directors of the British Institution.³⁰ This institution purchased also other paintings by painters active in London, including a large canvas by West, *Our saviour healing the sick in the temple*, paid in 1815 the unprecedented sum of 3000 guineas. The purpose was to patronize domestic artists and establish a National Gallery,³¹ which will be founded in 1824.

III EMPIRICAL ANALYSIS

In this section, we report the results of our hedonic regressions for the logged price of paintings and additional empirical investigations. Table 2 shows the price regression based on the full data set and the one based on the reduced data set with complete data on the surface area of the paintings (the latter is useful to confirm the main results in a more homogenous group of high-quality paintings). Both regressions control for the artists' fixed effects (reported in the Appendix from the baseline regression) and the full specification controls also for the auction houses' fixed effects (reported in the Appendix as well). The remaining control variables are common to the two regressions.

Some of the control variables have standard implications found in other investigations of historical art markets (Etro and Pagani, 2012; Etro and Stepanova, 2015 2016, 2017): copies and paintings sold in groups are priced less, while weak results emerge on the support of the painting (mainly because it was rarely recorded in the catalogues). Other proxies for the quality of the item, such as the presence of an inscription on the painting, the length of the description in the catalogue, a positive commentary in the same description and the record of previous or current owners are positively correlated with prices. The reduced sample shows that prices were increasing and concave in the surface area, but the peak of prices occurs for a relatively small area, around 4 square metres. It is likely that space constraints in the collectors' homes constrained demand determining a point of saturation.

On the basis of the baseline regression, we use the year dummies to build a nominal hedonic price index, which is presented in Fig. 1. This is particularly reliable because it is based on a large number (210,000) of observations (which makes estimates of each year coefficients extremely precise) and because we

³⁰ Wilkie will gain even more from the copyrights of his paintings. According to Hamilton (2014, p. 219), 'Turner's 100 guineas for copyright of his *Venice* is put into the shade by comparison with the £ 1200 that another star of the engraved painting world, David Wilkie, was paid in 1829 for the copyright of *Chelsea Pensioners Reading the Gazette of the Battle of Waterloo*. This was in addition to the £ 1260 that the Duke of Wellington paid for it on commission. The engraver, John Burnet, was to receive £ 1575 for his work engraving this large plate, size $28\frac{1}{4} \times 17$ inches, plus one-third of the profits from the sale of the prints'.

³¹ The famous scientist Joseph Banks was a strong supporter of these kinds of economic incentives for the arts. In a letter of 1805, he wrote: 'The Venetian School arose when that Town was the Emporium of the East; the Flemish when Antwerp was that of the Western World; and the Roman when appeals to the Roman Ecclesiastical Courts made their Lawyers almost as rich as our Civilians are now ... the time is come when England has the means through her commercial prosperity to foster a fourth school ... If half the money that has of Late years been lavished upon Repainted originals had been divided among our artists, the business would by this time have been done ... The Arts will always flourish in Proportion to the patronage given them by the Rich'.

Table 2
Price regressions (log of nominal prices)

	Baseline OLS regression		OLS regression on paintings with known size	
Artists' fixed effects	(YES)		(YES)	
Auction houses' fixed effects			(YES)	
Year dummies	(YES)		(YES)	
Months dummies	(YES)		(YES)	
Size (in metres)			0.189***	(0.017)
Size (in metres squared)			-0.0230***	(0.002)
Unknown support	Omitted		Omitted	
Canvas	0.860***	(0.034)	0.009	(0.048)
Copper	0.015	(0.032)	-0.020	(0.069)
Panel	0.380***	(0.025)	0.076**	(0.032)
Copy	-0.720***	(0.015)	-0.948***	(0.067)
Inscribed	0.281***	(0.042)	0.238**	(0.113)
Nr paintings sold together	-0.814***	(0.011)	-0.332***	(0.054)
Description length	0.0036***	(0.00003)	0.0017***	(0.00007)
Beautiful	0.767***	(0.017)	0.429***	(0.04)
Current place known	1.382***	(0.029)	0.959***	(0.05)
Previous owner known	0.783***	(0.017)	0.436***	(0.039)
Bought-in	0.0041	(0.01)	0.622***	(0.046)
Sold	-0.216***	(0.009)	0.0607*	(0.036)
Constant	1.469***	(0.044)	1.236***	(0.227)
Observations	210 471		9 727	
Adjusted R^2	0.33		0.57	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

directly control for quality through the artists' fixed effects (such a control was not feasible in other hedonic price indexes for historical periods due to the lack of enough data per painter per year).³² Therefore, this nominal index represents the market price of a representative painting with given quantifiable characteristics over time, or, equivalently, it represents the value of a diversified investment in the British art market. We have also run the baseline regression on the basis of prices adjusted for the cost of living in London,³³ obtaining very similar results. The corresponding real price index is also shown in Fig. 1.

In the Appendix (Table A1), we report the coefficients for the artists' fixed effects divided by national schools. The reference is the pool of paintings whose authors are unknown or with a low number of observations in the data set. Between the imported paintings, Dutch artists from the 1600s are the most frequent and best paid together with classical Italian artists from 1500s and 1600s. Between the artists of the 1700s, we mainly find *vedutisti* such as Canaletto, with extremely high prices, Gaspar van Wittel, Michele Marieschi,

³² Unfortunately we do not have enough evidence on repeated sales to use them to build alternative estimates or price indexes.

³³ The cost of living time series are from Clark (2010). Supplementary data can be found on the website <http://www.econ.ucdavis.edu/faculty/gclark/data.html>

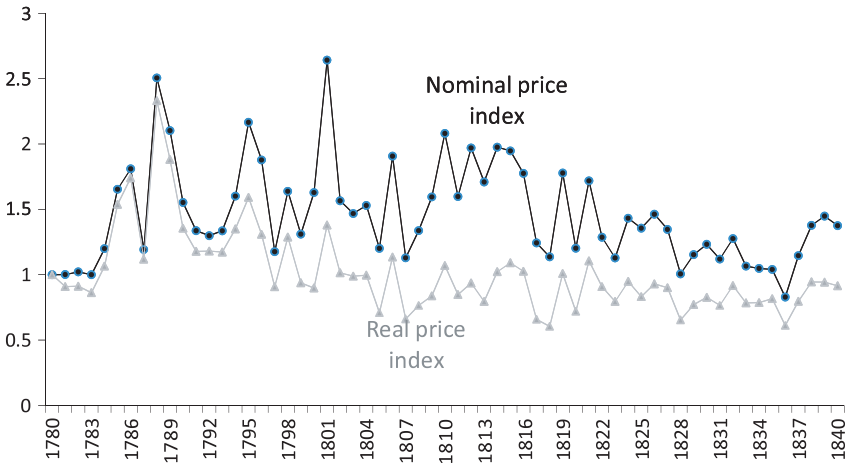


Figure 1. Art price index in London (1780–1840). [Colour figure can be viewed at wileyonlinelibrary.com]

Giovanni Paolo Panini and even minor ones such as Luca Carlevariis and Giovanni Battista Cimaroli, French artists such as Claude Vernet, Jean Baptiste Greuze, Hubert Robert, Philip Mercier and Jean Antoine Watteau, few Dutch artists, such as Willem van Mieris, Jan van Gool, Rachel Ruysch and Jan van Huysum and Flemish ones, such as Pieter Angellis and Joseph von Aken (who were actually active in London).

Evaluations for British painters are much lower on average. Remarkably, the British school shows its highest prices for the two most representative landscape painters of its Golden Age, namely William Turner and John Constable. In addition, other famous specialists of landscapes, such as Richard Wilson, Philip de Loutherbourg and Francis Danby, rank well in the British school. Similarly, the most famous portraitists, namely Joshua Reynolds, Thomas Lawrence, Thomas Gainsborough, Allan Ramsay and the Swiss born Angelica Kauffmann, appear to be well recognized on the monetary scale, while the portraits of George Romney reached lower prices.³⁴ Indeed, in this period landscapes and portraits were still the two leading genres in terms of both demand and artistic achievement. Between the most traditional history painters, we find John Singleton Copley and Benjamin West, who were between the best paid artists of the time and will export the Grand Manner to the United States.³⁵ The extreme realism of Joseph Wright of Derby, the

³⁴ Part of this is due to the fact that Romney was active outside the academic circle and public display. 'Unlike Reynolds, Romney had no wish to impose his own artistic notions upon his clients, or to make them look like anything other than the upper class, wealthy and tasteful individuals they were more than happy to be. He did his job extremely well, and charged considerably lower prices than his leading rivals – so although he often complained of the drudgery, this did not stop him from going through an enormous volume of business and acquiring considerable wealth in the process' (Solkin, 2015, p. 204).

³⁵ West also received an annual wage of £ 1000 from the King as well as major compensations for the royal commission, such as the £ 1260 for the 'Moses receiving the law on Mount Sinai' (1784).

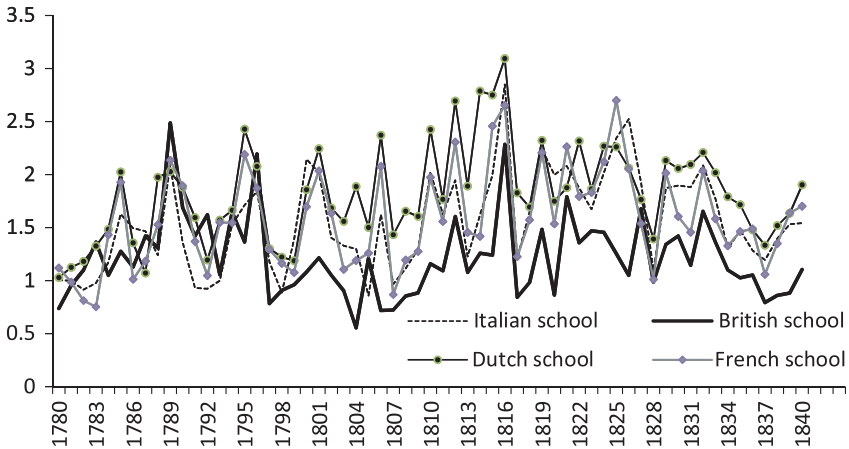


Figure 2. Price indexes by national school (nominal). [Colour figure can be viewed at wileyonlinelibrary.com]

visionary dreams of Henry Fuseli and the wonderful horses of George Stubbs were also priced above average.

Instead, prices are much lower for British paintings of the early portrait painters such as Cornelius Johnson, Robert Walker, William Dobson, Peter Lely and Godfrey Kneller, the first important figurative painter, James Thornhill,³⁶ and one of the first painters of landscapes, John Wootton. Most of all, also the beginners of the British Golden Age and of its innovative *conversation pieces*, William Hogarth and Francis Hayman, rank well behind average.³⁷

In Fig. 2, we report price indexes for British, Dutch, Italian and French paintings built in the same way as the general index on each respective subsample.³⁸ Controlling for the artist fixed effects within each school, these indexes reflect the evolution of the price of a representative painting present in the British collections and traded in the London art market for each school, independently from changes in the quality of domestic and imported works over time (in particular, the index is deperated from the increase in quality of imported paintings at the turn of the century when important continental collections were sold in London). While the general pattern is very

³⁶ Even in the primary market, Thornhill hardly managed to get substantial compensations. As Pears (1988, pp. 136–137) tells us, in 1717 he ‘was negotiating with the directors of Greenwich Hospital to establish his rate of pay. Although he made the point that under Charles I Rubens had been paid £ 10 a yard for the Banqueting House and more recently Lord Montagu had paid Rousseau £ 7, the directors rejected his request for a mere £ 5’ and Thornhill had to accept £ 3 a yard.

³⁷ Even lower were the prices of Irish artists, such as George Barret, James O’Connor and James Barry. Only the first obtained some initial success. According to Arnold (1977, p. 69), there are ‘a number of somewhat apocryphal stories about the large sums of money Barret earned from his paintings, but it is certain that he was enormously popular. He became bankrupt, however, and was rescued towards the end of his life by Edmund Burke, who secured for him the lucrative sinecure of Master Painter to the Chelsea Hospital’.

³⁸ For a more realistic visual inspection, we have scaled the initial price level of each national school according to school coefficients derived from a pooled regression.

similar across different schools, the gap between the price of a representative British painting and the price of the representative imported painting remains substantial along all the period under consideration. This confirms the results by Bayer and Page (2011). However, in spite of control for artists' fixed effects, price differentials across schools can still reflect selection of higher quality imports and do hide compositional changes, since some painters were gaining appreciation and others were losing it within each school. To understand whether the demand for new British paintings was actually increasing in the auction market, we should move to analyse return rates from the investment in different artistic schools and different painters.

As well known, the financial market of London was already the most advanced in the world during this period. But also the auction market was extremely well organized by the end of the 1700s, with a number of competing auction houses where British collectors could trade art. Our regression on the reduced sample provides auction houses' fixed effects that are shown in the Appendix (Table A2), where we also report the number of observations by auction house. Christie's was, by large, the most frequent auction house and enjoying a positive price differential (for given painter and other characteristics) compared to the sales from unknown or minor auctions houses. Sotheby's was still a minor player with prices below average at the time. Price gaps between auction houses could reflect differentiated strategies focusing on works of various quality (as still in modern auctions), but the auction market could be regarded as extremely competitive, and therefore it could represent an interesting investment opportunity.³⁹ Possibly, for the first time in art history, buying art could be seen not only as a hobby but also as a mere financial investment whose expected return had to be taken into account and compared with other investments. Our next task is to verify how attractive was buying art and in particular British art in this secondary market.

Was investment in British art an attractive financial investment?

In a flourishing financial centre such as London investment in art could be seen as a useful source of diversification with respect to traditional investments. The first investment option, bonds, was guaranteeing a 3% nominal interest rate for all the period under consideration through the purchase of a perpetual gilt (with no maturity) issued by the Bank of England. This bond provided a constant baseline nominal rate for financial investments, anchoring

³⁹ The efficiency of the London auction market can be evaluated also comparing prices in London and other competing art centres of continental Europe. The most important was Paris and we have a comparable and overlapping data set on art auctions in Paris over the period 1792–1820, largely described in Etro and Stepanova (2015). Converting prices from London and Paris auctions into units of a standard consumption basket through the price series collected by Allen (2001), we can obtain relative prices that are comparable (the composition of the basket is the same for both locations: the cost of a consumption basket is nominated in local currency, that is, in francs – in France and in pounds – in London). We found 63 cross-border sales extracted from our data sets: in each case, the first sale happens in Paris and the subsequent sale happens in London. Differentials in price changes are small, but appear to suggest an increase in London prices by the end of the period.

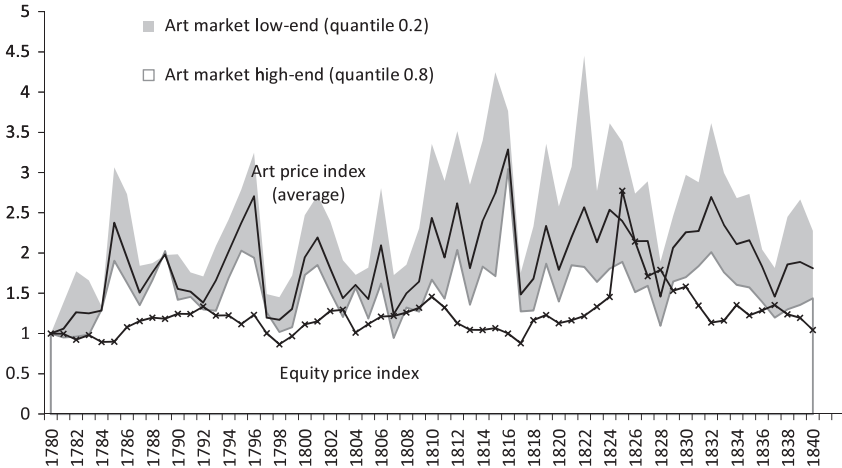


Figure 3. Art prices and equity prices in London (nominal).

the return of alternative investments. The second option, stocks, was available through investment in the London stock market, which could offer a variety of risky assets on which we have price records, for instance, from Piketty and Zucman (2014).⁴⁰ The Piketty-Zucman equity price index does not include dividends, on which there are no comprehensive data for the entire stock market, therefore it can be interpreted as an index of capital gains. In Fig. 3, we compare the nominal Piketty-Zucman index with our art price index (also decomposed in the high and low end of the market).

To evaluate the attractiveness of art investment and, in particular, of investment in the different artistic schools we use a standard *Capital Asset Pricing Model*,⁴¹ following similar applications on modern data proposed by Stein (1977), and used by Edwards (2004) on Latin American art, by Hodgson and Vorkink (2004) on Canadian art and by Agnello (2016) on U.S. art. The aim is to verify whether art investment could be a useful source of portfolio diversification for British investors.

We first compute the yearly rates of return of investment in art as well as in the different national schools from the price indices derived above. Given these, the CAPM equation for investment in an art school i implies:

$$(R_i + D_i) - R = \beta_i[(R_m + D_m) - R] \quad (1)$$

where R_i is the financial return of investment in paintings of the school i , D_i is the 'aesthetic dividend' from holding paintings of school i (Baumol, 1986), R is the constant riskless rate, R_m is the return from capital appreciation derived from the index of capital gain and D_m is the dividend rate in the stock

⁴⁰ Equity price index is taken from Table UK.15a of the Supplementary data in Piketty and Zucman (2014). Full data can be found on the website <http://gabriel-zucman.eu/files/PikettyZucman2013Book.pdf>

⁴¹ The origins of this foundational model start with Markowitz (1952) and end with the derivations by Sharpe (1964) and Lintner (1965).

market. In the absence of comprehensive data on dividends, we adopt the heroic assumption that the dividend rate was constant, so that all the variability of the stock market return is captured by the capital gains. The beta coefficient $\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)}$ is the sensitivity of the expected excess asset returns to the expected excess market returns. It is well known that the CAPM does not fully explain the differences in assets' returns and that the lack of a complete market portfolio makes it impossible to properly test for the same validity of the CAPM (Fama and French, 2004). Nevertheless, it is also understood that market betas represent an important element of the attractiveness of assets in a portfolio. For this reason, it is interesting to estimate the betas for the returns on investment in art in general and in the different national schools. A regression:

$$R_i = \alpha_i + \beta_i R_m \quad (2)$$

over the 60 years available provides an estimate of the beta for each school β_i and of the coefficient $\alpha_i = R - D_i + \beta_i(D_m - R)$, from which we can recover the aesthetic dividend of each school:

$$D_i = R - \alpha_i + \beta_i(D_m - R)$$

conditional on the riskless rate R and the dividend rate of the stock market D_m .

In Table 3, we report average return rate (always net of dividends), the standard deviation (SD) and estimated alphas and betas for investments in the stock market and in art. We also decompose the latter in investments in the four main national schools and the non-attributed paintings, and also in the low and high ends of the market. The average rate of capital gains in the stock market is 1.1% and the financial return from art investment is 4.3%, which is broadly in line with the high risk of this investment. Between schools, the highest return is for the British school (7.2%), followed by the French school (6.4%), the Italian school (5.2%) and the Dutch school (4.4%), while investment in paintings without attribution had a lower return than average (4%). In line with the expected positive correlation of risk and return, the SD

Table 3
Average nominal returns, SD, alpha and beta

	Return	SD	Alpha	Beta
Equity index	0.011	0.16		
Art price index (average)	0.043	0.258	0.014	0.0483
Art market Low-end (quantile 0.2)	0.054	0.3	0.028	0.187
Art market High-end (quantile 0.8)	0.04	0.266	0.01	-0.005
Italian school	0.052	0.309	0.027	0.261
British school	0.072	0.38	0.043	0.077
Dutch school	0.044	0.275	0.013	-0.0586
French school	0.064	0.352	0.036	0.132
Not attributed artists	0.04	0.307	0.014	0.028

of the return rates show that the most risky investment was in the British art school, followed by the French school, the Italian school, the Dutch school and the non-attributed paintings.

The estimated beta for art investment is $\beta_{\text{Art}} = 4.8\%$ which implies that art investment was a potential source of diversification in the portfolio of British investors. The estimated betas for the national schools are $\beta_{\text{Ita}} = 26.1\%$ for the Italian school, $\beta_{\text{Fra}} = 13.2\%$ for the French one, $\beta_{\text{Bri}} = 7.7\%$ for the British and $\beta_{\text{Dutch}} = -5.9\%$ for the Dutch and Flemish school together. This shows that returns on investments on Italian and French paintings were poorly correlated with the stock market, while the return on investment in British and Dutch art was basically uncorrelated with the stock market return.

The estimated constants are all positive. In principle, they allow us to recover the aesthetic dividend of art investment in function of the dividend rate in the stock market. To fix ideas and only for explanatory purposes, assuming that the latter was the same as the riskless rate of 3% would generate an aesthetic dividend $D_i = 0.03 - \alpha_i$. Given the estimate $\alpha_{\text{Art}} = 1.4\%$, the aesthetic dividend would be 1.6% for an average art investment, higher for the Dutch school, followed by the Italian school, the French school and, last, the British school. The aesthetic dividend from non-attributed paintings, instead, would be the same as for art investment in general (1.6%). If instead we assume a higher dividend rate in the stock market, which would be consistent with a higher financial return on equity (capital appreciation plus dividend) compared to art,⁴² the implied aesthetic dividend for the Italian school would be above all the others, leaving always the aesthetic dividend for the British school as the worst. These results appear broadly in line with the aesthetic perception at the time, as well as with the higher quality of foreign paintings traded in the London market, especially Italians and Dutch compared to the British paintings.

Our simple application of the CAPM model suggests that investment in art, and in particular in British art, was an attractive investment even if British collectors did prefer foreign paintings.⁴³ A simple stylized exercise of optimal portfolio allocation can give some more insights. In Fig. 4, we have plotted the financial return and the SD of different assets. To focus on financial aspects only, we have neglected aesthetic dividends but we have assumed, as above, that the dividend rate in the stock market was 3%. As standard in finance theory, the *efficient frontier* collects the set of portfolios that combine these assets in proportions that minimize the total variance of the portfolio for a given portfolio return. We have computed this efficient frontier and

⁴² As mentioned above, the rate of capital appreciation was 1.1% and the financial return from art investment was 4.3%, which implies that a dividend rate above 3.2% would deliver a higher return on stocks than on art (this would be consistent with modern findings in Baumol, 1986). Moreover, the implied aesthetic dividend would be positive for all schools.

⁴³ The best *ex post* returns in the data set were for paintings by Constable, Wilkie, Romney and Turner. We did not find any significant correlation between average prices and average returns, as the absence of arbitrage opportunities would require.

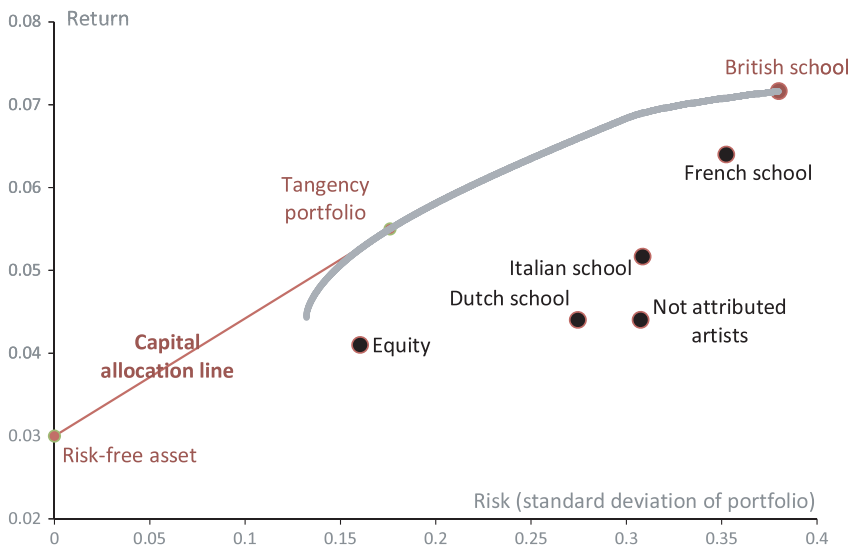


Figure 4. Risk and Return for alternative assets. [Colour figure can be viewed at wileyonlinelibrary.com]

shown in Fig. 4 in bold. Given the riskless rate of 3%, each investor should choose its favourite portfolio on the *capital allocation line*, namely a linear combination of the riskless asset and the ‘tangency portfolio’, also shown in Fig. 4. The tangency portfolio can be easily determined: such a simple exercise delivers that about half of the risky investment should be destined to the stock market (48%) with the residual art investment mostly allocated to the British school (28%) for its high return and to the French school. Of course, personal preferences (for risk and for art) would determine the share of the tangency portfolio on total investment and would alter the share of investment in each artistic school. However, this ‘back of the envelop’ computation confirms that there were good financial reasons to purchase British paintings on the London auction market. Since we have seen that most of the trade was focused on Dutch and Italian paintings, with only 17% for British paintings, this was putting an upward pressure on the prices of the domestic school.⁴⁴ Most important for our purposes, British paintings could be purchased also in the primary market (indeed mainly domestic paintings were available in the primary market), therefore the upward pressure was applying also on the prices of the living British painters.

Further financial investigations would be entirely speculative in the absence of more accurate historical data on the stock market returns. Nevertheless, all this suggests that increasing investment in art and especially in domestic paintings could have been responsible (together with other factors, such as the

⁴⁴ The results from the optimal portfolio analysis (using *R*-program) are available from the authors. Remarkably, the optimal share of investment in British art is even increasing over time moving from 21% of the tangency portfolio in 1780–1800 to 33% in 1801–1820 and 43% in 1821–1840.

growth of print trade or the impact of the public exhibitions) for an increase in the profitability of the artistic profession in England.

Were the new British artists innovators?

Our econometric analysis has shown that British paintings were initially undervalued compared to the continental ones but they were also appreciating more. However, this neither implies that their value was reaching continental standards (indeed Bayer and Page, 2011, confirm underevaluation on average until the end of the XIX century) or implies that new British artists were driving a process of convergence (indeed a revaluation of the old British masters may have driven the high returns).

To investigate whether the raising demand for British paintings was responsible for attracting new talents to the profession and promoting new artistic innovations in the domestic market, we can verify if the quality of new British art, as priced by the market, did increase over time. In Fig. 5 we relate the price of a representative painting by artists of different national schools and their year of birth. The price of British painters increases rapidly with the year of birth, in line with our earlier insights from the artists' fixed effects. A negative trend emerges immediately for the Italian school, while no clear trend appears to emerge for the French and Dutch schools. This is compatible with the fact that the increasing demand for art of this period attracted not only new domestic painters, but also better ones, at least in terms of market evaluation. But of course, other explanations could be related to changes in other features of the paintings, such as the certain attribution, the size and more.

To verify whether new British paintings were indeed increasing in value compared to others after controlling for the characteristics of the paintings, in Table 4, we restrict our sample to sales of paintings with a certain attribution (excluding copies and paintings that are bought-in) and with known surface area, controlled more precisely with a set of size dummies, and we determine the price differentials between paintings of the main national schools. We also use real prices (adjusted for CPI) as dependent variable. The role of the usual control variables remains largely unchanged compared to the baseline regressions. Moreover, column (1) confirms that British paintings were on average 21% cheaper than French paintings, and even cheaper compared to Dutch and Italian ones. Column (2), however, interacts the British dummy with the year of birth of the painter net of 1600, the beginning of the century in which the British school starts supplying important artists. The coefficients show that a representative painting by a British artist born in 1600 was about 60% cheaper than an imported painting, but this gap was reduced over the years reaching parity in the year $1600 + \frac{0.886}{0.00503} \approx 1776$, corresponding to artists active since the turn of the century (as Turner and Constable). Column (3) repeats the same analysis in a reduced data set where we have full information on the surface area of the paintings. In spite of the different sample, the result is exactly confirmed with a break-even year in $1600 + \frac{1.262}{0.00719} \approx 1776$. This is consistent with the fact that the increasing demand for art of this period and

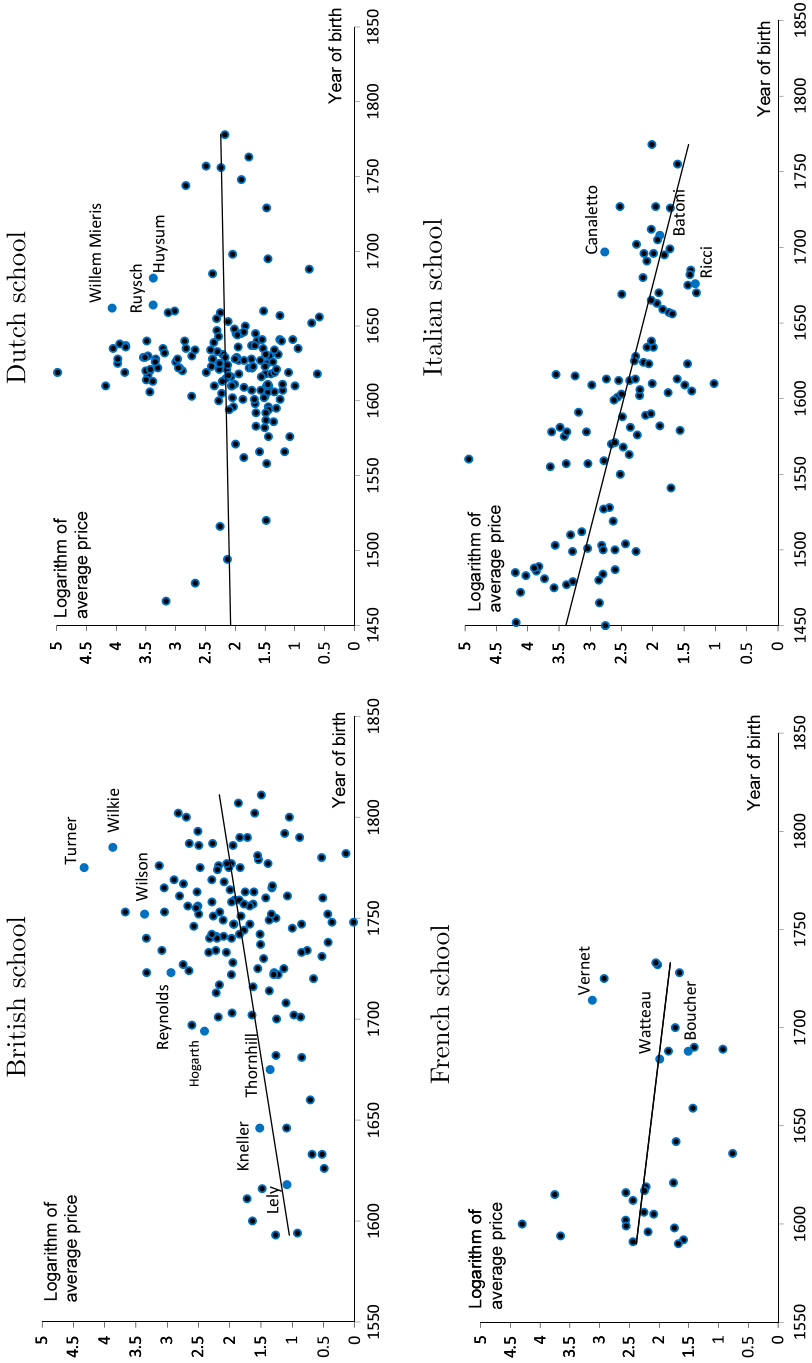


Figure 5. School differences in age-average price. [Colour figure can be viewed at wileyonlinelibrary.com]

Table 4
Price regressions (Log of real prices)

	Regression (1)		Regression (2)		Regression (3)	
French school	Omitted		Omitted		Omitted	
Dutch school	0.00182	(0.1)	0.00123	(0.07)	-0.116	(-1.57)
Italian school	0.0145	(0.79)	0.0123	(0.67)	-0.152*	(-2.07)
British school	-0.231***	(-12.09)	-0.886***	(-26.54)	-1.262***	(-6.52)
Interaction with birth - 1600			0.00503***	(23.89)	0.00719***	(5.32)
Year dummies	(YES)		(YES)		(YES)	
Month dummies	(YES)		(YES)		(YES)	
Auction houses' fixed effects	(YES)		(YES)		(YES)	
Size unknown	Omitted		Omitted		-	
Size [0-0.1] m ²	0.661***	(9.24)	0.652***	(9.14)	Omitted	
Size [0.1-0.3] m ²	0.767***	(16.39)	0.768***	(16.45)	0.217**	(3.04)
Size [0.3-0.5] m ²	0.819***	(12.75)	0.826***	(12.91)	0.333***	(4.05)
Size [>0.5] m ²	0.873***	(25.51)	0.879***	(25.78)	0.426***	(6.21)
Unknown support	Omitted		Omitted		Omitted	
Canvas	0.105	(1.6)	0.0885	(1.35)	-0.01	(-0.11)
Copper	-0.216***	(-3.61)	-0.208***	(-3.48)	0.0472	(0.39)
Panel	0.00877	(0.19)	0.0152	(0.33)	0.141*	(2.48)
Nr paintings sold together	-1.046***	(-64.49)	-1.028***	(-63.49)	-0.645***	(-6.00)
Inscribed	0.221**	(3.19)	0.247***	(3.58)	0.0664	(0.36)
Description length	0.00367***	(61)	0.00365***	(60.99)	0.00309***	(22.91)
Beautiful	0.825***	(29.98)	0.816***	(29.76)	0.503***	(7.72)
Current place known	1.202***	(27.86)	1.202***	(27.97)	0.888***	(11.13)
Previous owner known	0.622***	(22.38)	0.638***	(23.01)	0.434***	(6.74)
Constant	-2.667***	(-28.63)	-2.665***	(-28.72)	-3.982***	(-6.06)
Observations	77 421		77 421		3 490	
R ²	0.35		0.36		0.52	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

the increasing investment in British art did attract both new and better domestic painters, leading to what we now regard as the British Golden Age.

IV CONCLUSIONS

We have analysed the evolution of the price of paintings sold at auctions in London between 1780 and 1840. A financial analysis of this market shows that investment in art was an attractive opportunity of diversification in this period, and investment in British art in particular was a valuable option. As a consequence, art trade and domestic art production flourished. We have argued that the price of a representative painting increased rapidly with the emerging British artists and reached foreign prices in the last decade of the

1700s. This suggests that the increasing demand for British art of this period attracted new and better domestic painters.

The subsequent period, the Victorian age between 1840 and 1900, has been analysed in detail by Bayer and Page (2011). This period continued the trends emphasized in our work, and the fast economic development of England was associated with a further increase in the price of paintings and artistic product differentiation and innovation (especially with the Pre-Raphaelites under the influence of Ruskin). The secondary art market was always more dominated by Christie's as the leading auction platform and by art dealers as buyers and intermediaries.⁴⁵ In addition, the volume of trade of contemporary and domestic paintings increased compared to that of old master paintings. However, at the end of the century, economic growth started to slow down and art prices started to decline as well. New markets and new leading artistic movements were emerging in Paris and elsewhere.

Nevertheless London will retain the international status of the leading auction centre during the following century, and most of the secondary trade in the high segment of the art market will take place in Christie's or Sotheby's auctions around the world.

ACKNOWLEDGEMENTS

We are grateful to Karol Jan Borowiecki, Neil De Marchi, William Goetzmann and Alessandro Nuvolari for comments.

⁴⁵ The most famous art dealers in London during the XIX century were Colnaghi, Agnew, Gambart, Graves, Vokins, Wallis and Tooth.

Table A1
Artists' fixed effects

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
British school							
TURNER, JOSEPH MALLORD WILLIAM	63	1.358***	(0.168)	HAMILTON, WILLIAM	157	0.158	(0.107)
CONSTABLE, JOHN	116	1.256***	(0.124)	BARRET, GEORGE (Irish)	529	0.135**	(0.0587)
COPELY, JOHN SINGLETON (American)	21	1.137***	(0.291)	FREEBAIRN, ROBERT	135	0.127	(0.115)
HEAD, GUY	181	1.077***	(0.1)	PETHER, ABRAHAM	579	0.110*	(0.0562)
NASMYTH, PATRICK	89	0.957***	(0.141)	LUNY, THOMAS	260	0.11	(0.0834)
WILKIE, DAVID	89	0.945***	(0.142)	DANIELL, WILLIAM	188	0.0947	(0.0977)
WILSON, RICHARD	735	0.840***	(0.0501)	WHITCOMBE, THOMAS	84	0.048	(0.146)
BEECHEY, WILLIAM	190	0.824***	(0.0971)	SMITH (OF CHICHESTER), GEORGE	160	-0.0576	(0.106)
FRASER, ALEXANDER (I)	84	0.789***	(0.146)	SCOTT, SAMUEL	210	-0.0733	(0.0924)
HAMILTON, GAVIN	32	0.764***	(0.236)	REINAGLE, GEORGE PHILIP	83	-0.0961	(0.147)
LOUTHERBOURG, PHILIP JAMES DE	478	0.747***	(0.0617)	HODGES, WILLIAM	222	-0.109	(0.0899)
DANBY, FRANCIS (Irish)	51	0.741***	(0.187)	HEAPHY, THOMAS (I)	101	-0.106	(0.133)
JACKSON, JOHN	66	0.726***	(0.164)	RATHBONE, JOHN	354	-0.133*	(0.0715)
WESTALL, RICHARD	301	0.672***	(0.0774)	ZOFFANY, JOHANN JOSEPH (German)	176	-0.158	(0.101)
KETTLE, TILLY	50	0.635***	(0.189)	ELMER, STEPHEN	127	-0.161	(0.119)
GLOVER, JOHN	134	0.621***	(0.115)	RIGAUD, JOHN FRANCIS	177	-0.174*	(0.101)
LAWRENCE, THOMAS	260	0.540***	(0.0833)	LAPORTE, JOHN	81	-0.207	(0.148)
BARKER, BENJAMIN (II)	120	0.504***	(0.122)	LAMBERT, GEORGE	251	-0.220***	(0.0846)
POWELL, CHARLES MARTIN	246	0.475***	(0.0855)	TRESHAM, HENRY	84	-0.262*	(0.146)
OPIE, JOHN	247	0.458***	(0.0853)	STONE, HENRY	126	-0.267**	(0.119)
WARD, JAMES	378	0.446***	(0.0692)	ARNALD, GEORGE	123	-0.264**	(0.12)
WILSON, JOHN H. (JOCK)	112	0.445***	(0.126)	DOBSON, WILLIAM	191	-0.274**	(0.0969)
BONINGTON, RICHARD PARKES	265	0.420***	(0.0824)	HOPNER, JOHN	132	-0.290**	(0.116)
STOTHARD, THOMAS	417	0.402***	(0.066)	SMITH Brothers	154	-0.323***	(0.108)
BLAKE, BENJAMIN	84	0.398***	(0.146)	BROOKING, CHARLES	427	-0.331***	(0.0653)
MORLAND, GEORGE	2706	0.396***	(0.0274)	MORTIMER, JOHN HAMILTON	184	-0.340***	(0.0986)

Table A1 (Continued)

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
REYNOLDS, JOSHUA	1726	0.385***	(0.0336)	BROWN, MATHER (American)	61	-0.353***	(0.171)
REINAGLE, RAMSAY RICHARD	88	0.379***	(0.142)	STUART, GILBERT (American)	18	-0.356	(0.314)
BOURGOIS, PETER FRANCIS	182	0.375***	(0.0992)	SINGLETON, HENRY	263	-0.402***	(0.0827)
BARKER, THOMAS (BARKER OF BATH)	74	0.370***	(0.155)	WOOTTON, JOHN	291	-0.412***	(0.0787)
NAMYTH, ALEXANDER	261	0.350***	(0.083)	TULL, EBENEZER	110	-0.431***	(0.127)
TOWNE, CHARLES	287	0.349***	(0.0792)	WALKER, ROBERT	116	-0.444***	(0.124)
WEST, BENJAMIN (American)	253	0.334***	(0.0843)	ROMNEY, GEORGE	290	-0.481***	(0.0789)
SMIRKE, ROBERT (I)	286	0.330***	(0.0794)	HOGARTH, WILLIAM	755	-0.509***	(0.0494)
MARLOW, WILLIAM	403	0.324***	(0.0671)	JOHNSON, CORNELIUS (I)	649	-0.529***	(0.0535)
STUBBS, GEORGE	278	0.280***	(0.0805)	O'CONNOR, JAMES ARTHUR (Irish)	161	-0.550***	(0.105)
FUSELI, HENRY (Swiss)	241	0.256***	(0.086)	MONAMY, PETER	460	-0.583***	(0.0629)
KAUFFMANN, ANGELICA	379	0.246***	(0.0691)	DANIELL, THOMAS	113	-0.616***	(0.126)
SERRES, DOMINIC	191	0.242**	(0.097)	LELY, PETER	975	-0.641***	(0.0439)
NORTHCOTE, JAMES	274	0.223***	(0.0811)	HAYMAN, FRANCIS	101	-0.642***	(0.133)
REINAGLE, PHILIP	445	0.222***	(0.0639)	SANDBY, PAUL	82	-0.650***	(0.147)
FIELDING, NATHAN THEODORE	71	0.212	(0.158)	CRADOCK, MARMADUKE	88	-0.658***	(0.142)
FAIRFIELD, CHARLES	75	0.204	(0.154)	KNELLER, GODFREY, BART. (German)	548	-0.664***	(0.0578)
WHEATLEY, FRANCIS	347	0.192***	(0.0722)	SARTORIUS	127	-0.714***	(0.119)
HOWARD, HENRY	97	0.188	(0.136)	SWAINE, FRANCIS	150	-0.752***	(0.109)
ANDERSON, WILLIAM	262	0.170**	(0.0828)	THORNHILL, JAMES	123	-0.779***	(0.12)
WRIGHT, JOSEPH (WRIGHT OF DERBY)	264	0.169**	(0.0825)	BARRY, JAMES (Irish)	113	-0.876***	(0.126)
TAVERNER, WILLIAM	93	0.168	(0.138)	COOPER, JOSEPH	91	-1.101***	(0.14)
GAINSBOROUGH, THOMAS	1190	0.167***	(0.0398)	ABBOTT, LEMUEL FRANCIS	85	-1.605***	(0.145)
RAMSAY, ALLAN (II)	55	0.159	(0.18)	DE WILDE, SAMUEL	156	-1.900***	(0.107)
Dutch school							
WOUWERMAN, PHILIPS	139	1.628***	(0.113)	MIGNON, ABRAHAM	198	0.271***	(0.0958)
MIERIS, WILLEM VAN	160	1.438***	(0.106)	POELENBURGH, CORNELIS VAN	1020	0.219***	(0.0428)

Table A1 (Continued)

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
RUISDAEL, JACOB VAN	558	1.222***	(0.0572)	ASSELYN, JAN	411	0.196***	(0.0664)
OSTADE, ADRIAEN VAN	418	1.175***	(0.0659)	EVERDINGEN, ALLART VAN	274	0.190**	(0.081)
MIERS, FRANS VAN (THE ELDER)	162	1.174***	(0.105)	MAES, NICOLAES	250	0.168***	(0.0848)
HEYDEN, JAN VAN DER	251	1.130***	(0.0846)	STORCK, ABRAHAM	854	0.160***	(0.0466)
HOECH, PIETER DE	271	1.019***	(0.0815)	HELST, BARTHOLOMEUS VAN DER	254	0.149*	(0.0843)
VELDE, ADRIAEN VAN DE	654	0.983***	(0.053)	BEGA, CORNELIS PIETERSZ.	369	0.133*	(0.0701)
HOBBEMA, MEINDERD	827	0.987***	(0.0474)	NETSCHER, CASPAR	773	0.0876*	(0.0489)
BACKHUYSEN, LUDOLF	828	0.843***	(0.0473)	LUCAS VAN LEYDEN	223	0.0614	(0.0897)
WIJNANTS, JAN	953	0.842***	(0.0443)	VLIJGER, SIMON DE	502	-0.00651	(0.0603)
POTTER, PAULUS	527	0.810***	(0.0588)	BOL, FERDINAND	286	-0.0112	(0.0794)
OS, JAN VAN	258	0.731***	(0.0835)	WYCK, THOMAS	291	-0.0415	(0.0786)
BOTH, JAN	991	0.707***	(0.0435)	PALAMEDESZ., ANTHONIE	469	-0.0524	(0.0625)
GOOL, JAN VAN	88	0.705***	(0.142)	HOUBRAKEN, ARNOLD	87	-0.0552	(0.143)
BERCKHEYDE, GERRIT ADRIAENSZ.	211	0.703***	(0.0921)	HONDECOETER, MELCHIOR D'	510	-0.0628	(0.0599)
CUYP, AELBERT	2184	0.686***	(0.0301)	MOLENAER, KLAES	445	-0.091	(0.0639)
BORCH, GERARD TER (II)	439	0.684***	(0.0643)	GOYEN, JAN JOSEPHSZ. VAN	1424	-0.107***	(0.0367)
OSTADE, ISACK VAN	448	0.680***	(0.0637)	DROOCHSLOOT, JOOST CORNELISZ.	216	-0.1	(0.0911)
DOU, GERARD	726	0.678***	(0.0504)	SCHALCKEN, GODFRIED	776	-0.105***	(0.0488)
PYNACKER, ADAM	593	0.652***	(0.0556)	HEEREMANS, THOMAS	296	-0.111	(0.078)
RUYSCH, RACHEL	202	0.647***	(0.0947)	SAVERY, ROELANDT	215	-0.139	(0.0913)
CAPPELLE, JAN VAN DE	237	0.646***	(0.087)	WIT, JACOB DE	273	-0.145*	(0.0812)
LINGELBACH, JOHANNES	545	0.640***	(0.0578)	MOLIJN, PIETER DE	225	-0.147*	(0.0893)
HUYSUM, JAN VAN	386	0.606***	(0.0686)	LAER, PIETER VAN (BAMBOCCIO)	273	-0.161**	(0.0812)
BERCHEM, NICOLAES PIETERSZ.	2088	0.602***	(0.0309)	FLORIS, FRANS (I)	192	-0.202**	(0.0966)
DUIJARDIN, KAREL	647	0.589***	(0.0533)	BRAMER, LEONARD	221	-0.218**	(0.0901)
STEEN, JAN	1052	0.579***	(0.0422)	HALS, FRANS (I)	463	-0.219***	(0.0627)
NEER, AERT VAN DER	1126	0.527***	(0.0409)	MOLENAER, JAN MIENSE	489	-0.244***	(0.0611)
METSU, GABRIEL	432	0.526***	(0.0648)	BLOEMAERT, ABRAHAM	273	-0.283***	(0.0812)

Table A1 (Continued)

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
VELDE, WILLEM VAN DE	1828	0.476***	(0.0327)	HONTHORST, GERRIT VAN	375	-0.311***	(0.0694)
SWANEVELT, HERMAN VAN	921	0.438***	(0.045)	HEEM, JAN DAVIDSZ. DE	744	-0.374***	(0.0507)
WITTE, EMANUEL DE	227	0.420***	(0.0892)	HONDIUS, ABRAHAM	298	-0.402***	(0.0777)
REMBRANDT HARMENSZ. VAN RIJN	2591	0.413***	(0.0281)	MIEREVELD, MICHIEL JANSZ	255	-0.404***	(0.084)
WITTEL, GASPAS VAN	251	0.359***	(0.0846)	HEEMSKERCK, EGBERT (THE ELDER)	930	-0.671***	(0.0449)
RUYSDAEL, SALOMON VAN	447	0.341***	(0.0637)	DIEST, ADRIAEN VAN	295	-0.787***	(0.0782)
GOSSAERT, JAN	190	0.321***	(0.0971)	MASSYS, QUENTIN	194	0.276***	(0.0961)
Flemish school							
NEEFS, PEETER (THE ELDER)	417	0.850***	(0.066)	SNAYERS, PEETER	155	0.0329	(0.107)
STEENWYCK, HENDRIK VAN	268	0.451***	(0.082)	BRIL, PAUL	640	0.0182	(0.0536)
OMMEGANCK, BALTHAZAR PAUL	275	0.444***	(0.0809)	AKEN, JOSEPH VAN	59	-0.245	(0.185)
HERP, WILLEM VAN (I)	350	0.396***	(0.0719)	ANGELLIS, PIETER VAN	156	-0.00598	(0.107)
TENIERS, DAVID (THE YOUNGER)	4701	0.395***	(0.0218)	JORDAENS, JACOB (I)	656	-0.0477	(0.0529)
SNYDERS, FRANS	608	0.373***	(0.0549)	BRUEGHEL, JAN (THE ELDER)	2006	-0.163***	(0.0313)
MEULEN, ADAM FRANS VAN DER	449	0.371***	(0.0636)	PEETERS, BONAVENTURA (I)	227	-0.170*	(0.0889)
RUBENS, PETER PAUL	4505	0.366***	(0.0223)	LAIRESSE, GERARD DE	551	-0.267***	(0.0576)
COQUES, GONZALES	296	0.317***	(0.078)	DIENBEECK, ABRAHAM JANSZ	223	-0.274***	(0.0897)
BLOEMEN, JAN FRANS VAN	462	0.269***	(0.0627)	MOMPER, JOOS DE (II)	207	-0.282***	(0.0931)
TILBORGH, GILLIS VAN	206	0.210**	(0.0933)	HOREMANS, JAN JOSEPH (I)	212	-0.284***	(0.092)
DYCK, ANTHONIE VAN	3500	0.191***	(0.0246)	GRYEF, ADRIAEN DE	179	-0.305***	(0.1)
MIEL, JAN	557	0.187***	(0.0572)	BROUWER, ADRIAEN	942	-0.302***	(0.0446)
French school							
CLAUDE LORRAIN (CLAUDE GELLE)	1560	1.086***	(0.0352)	LACROIX, CHARLES FRANCOIS	110	0.214*	(0.127)
DUGHET, GASPARD (GASPARD POUSSIN)	1203	1.050***	(0.0397)	LA HYRE, LAURENT DE	136	0.146	(0.115)
VERNET, CLAUDE JOSEPH	989	0.673***	(0.0434)	LE BRUN, CHARLES	372	0.136*	(0.0697)
POUSSIN, NICOLAS	2570	0.475***	(0.0281)	MILLET, JEAN FRANCOIS (I)	403	0.119*	(0.0671)
BOURDON, SEBASTIEN	508	0.429***	(0.0599)	VOUET, SIMON	118	0.0606	(0.123)

Table A1 (Continued)

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
VALENTIN DE BOULOGNE	144	0.382***	(0.111)	LE SUEUR, EUSTACHE	380	0.031	(0.069)
GREUZE, JEAN BAPTISTE	430	0.377***	(0.065)	WATTEAU, JEAN ANTOINE	808	-0.0503	(0.0478)
ROBERT, HUBERT	104	0.303**	(0.131)	LANCRET, NICOLAS	306	-0.216***	(0.0767)
STELLA, JACQUES	283	0.270***	(0.0797)	BOUCHER, FRANCOIS	226	-0.253***	(0.0891)
PATEL, PIERRE (I)	408	0.253***	(0.0667)	MERCIER, PHILIP	20	-1.1724***	(0.2978)
Italian school							
CARRACCI, ANNIBALE	243	1.589***	(0.086)	GUERCINO	1155	0.462***	(0.0404)
BARTOLOMEO, FRA	137	1.111***	(0.114)	BRONZINO, AGNOLO	160	0.456***	(0.106)
ANDREA DEL SARTO	512	1.048***	(0.0597)	PIETRO DA CORTONA	613	0.447***	(0.0547)
SEBASTIANO DEL PIOMBO	157	1.039***	(0.107)	BAROCCI, FEDERICO	540	0.428***	(0.0582)
CARRACCI, LUDOVICO	528	0.968***	(0.0588)	GUARDI, FRANCESCO	259	0.396***	(0.0833)
CANALETTO (GIOVANNI ANTONIO CANAL)	1490	0.951***	(0.0359)	CARLEVARIIIS, LUCA	52	0.346*	(0.185)
RAFFAELLO SANTI	1131	0.821***	(0.0412)	BELLINI, GIOVANNI	215	0.340***	(0.0913)
LEONARDO DA VINCI	553	0.820***	(0.0575)	MOLA, PIER FRANCESCO	751	0.324***	(0.0496)
CORREGGIO (ANTONIO ALLEGRI)	1066	0.768***	(0.0423)	ROSA, SALVATOR	2105	0.313***	(0.0306)
DOLCI, CARLO	602	0.760***	(0.0552)	CIMAROLI, GIOVANNI BATTISTA	121	0.302***	(0.121)
BASSANO, JACOPO (JACOPO DA PONTE)	183	0.756***	(0.0989)	TINTORETTO, JACOPO	928	0.263***	(0.0448)
LUINI, BERNARDINO	130	0.735***	(0.117)	LOCATELLI, ANDREA	422	0.261***	(0.0656)
DOMENICHIINO (DOMENICO ZAMPIERI)	1329	0.692***	(0.0378)	MARATTI, CARLO	991	0.242***	(0.0435)
SCHEDONI, BARTOLOMEO	518	0.688***	(0.0594)	PANINI, GIOVANNI PAOLO	799	0.208***	(0.0481)
GIORGIONE	613	0.674***	(0.0547)	CARAVAGGIO, MICHELANGELO	564	0.137***	(0.0569)
MARIESCHI, MICHELE	168	0.628***	(0.103)	FETTI, DOMENICO	217	0.132	(0.0909)
TIZIANO VECELLIO	2459	0.586***	(0.0287)	BATONI, POMPEO GIROLAMO	75	0.0654	(0.154)
PARMIANINO (FRANCESCO MAZZOLA)	660	0.581***	(0.0528)	GIORDANO, LUCA	822	0.0444	(0.0475)
GIULIO ROMANO (GIULIO PIPPI)	409	0.529***	(0.0666)	SOLIMENA, FRANCESCO	279	0.0255	(0.0803)
RENI, GUIDO	2071	0.497***	(0.031)	RICCI, SEBASTIANO	353	-0.0253	(0.0716)
SCHIAVONE (ANDREA MELDOLLA)	241	0.497***	(0.0863)	TIEPOLO, GIOVANNI BATTISTA	157	-0.0896	(0.107)

Table A1 (Continued)

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
PORDENONE	228	0.492***	(0.0887)	CASTIGLIONE, GIOVANNI	323	-0.237***	(0.0747)
MICHELANGELO BUONARROTI	157	0.479***	(0.107)	RICCI, MARCO	257	-0.245***	(0.0836)
ALBANI, FRANCESCO	1159	0.469***	(0.0404)	AMIGONI, JACOPO	209	-0.320***	(0.0926)
VERONESE (PAOLO CALIARI)	1099	0.465***	(0.0414)	ZUCCARI, FEDERICO	295	-0.368***	(0.0781)
ZUCCARELLI, FRANCESCO	1179	0.464***	(0.0401)	PIAZZETTA, GIOVANNI BATTISTA	78	-0.427***	(0.151)
Spanish school							
MURILLO, BARTOLOME ESTEBAN	1859	0.556***	(0.0324)	VELAZQUEZ, DIEGO A	103	0.252***	(0.0476)
CANO, ALONSO	91	0.513***	(0.14)	ZURBARAN, FRANCISCO DE	64	-0.0582	(0.167)
MORALES, LUIS DE (EL DIVINO)	54	0.459**	(0.181)	RIBERA, JUSEPE DE	659	-0.0848	(0.0528)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table A2
Auction houses' fixed effects

Name	Obs.	Coef.	SE	Name	Obs.	Coef.	SE
Bullock (William)	37	1.277***	(0.214)	Edwards (Edward)	412	-0.360***	(0.107)
White (John)	208	1.180***	(0.121)	Hoggart and Phillips	61	-0.384**	(0.175)
Denew (James)	51	1.151***	(0.183)	Farebrother (Charles)	379	-0.392***	(0.104)
Stanley (George)	142	0.589***	(0.14)	Skinner and Dyke	206	-0.430***	(0.127)
Winstanley	44	0.387**	(0.197)	Squibb (George)	278	-0.511***	(0.11)
Christie's	3 214	0.344***	(0.0928)	Greenwood	300	-0.531***	(0.11)
Foster (Edward)	411	0.291**	(0.119)	Hermon (John A.)	137	-0.539***	(0.134)
Phillips (Harry)	1 202	0.196**	(0.0949)	King (Thomas)	66	-0.604***	(0.167)
Coxe (Peter)	1 108	0.193**	(0.0973)	Sotheby's	51	-0.836***	(0.396)
Robins (Henry J. & G. Henry)	126	0.11	(0.145)	Richardson (William)	48	-1.077***	(0.196)
Stewart (William)	119	0.00667	(0.139)	Abbott (William)	67	-1.266***	(0.233)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

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