The determinants of art prices: an analysis of Joan Miró

Los Determinantes de los Precios del Arte: Un Análisis de Joan Miró

Received 17 June 2018
Revised 15 January 2019
14 May 2019
Accepted 12 August 2019

Jennifer Cinefra
IESA Business School, Caracas, Venezuela
Urbi Garay
IESA Business School, Caracas, Venezuela and Universidad de la Sabana, Chia, Colombia, and
Claudia Mibelli and Eduardo Pérez
IESA Business School, Caracas, Venezuela

Abstract

Purpose – Relatively little is known about the determinants of the prices of paintings. The purpose of this paper is to analyse the price determinants of the art of Joan Miró, one of the great masters of Modern Art.
Design/methodology/approach – The authors analysed 255 artworks by Miró sold at Sotheby's and Christie's between 2003 and 2017, and performed a hedonic price regression to measure the impact of a series of variables on the prices of this artist's works.
Findings – Miró's works command higher prices, *ceteris paribus*, when they were painted on canvas, were sold at Sotheby's and in New York City or London, were traded during the evening session and depending on the period in which they had been painted, the size of their surface area, the number of words used to describe the respective lot and whether they had appeared in an art book. The prices of Miró's paintings increased substantially between 2003 and 2008 and then declined, coinciding with the global financial crisis of 2009.
Research limitations/implications – The results were obtained from prices established in art auctions, which represent only one portion of the market.
Originality/value – This is the first exhaustive study carried out on the determinants of the prices of Joan Miró's works. The artist represents an ideal case due to the large number of his works that have been sold at auctions. As yet, only studies of Pablo Picasso and Andy Warhol have been conducted. Joan Miró has well-defined artistic periods, which also allows us to determine the impact on the price of the works of the period in which it was created. This paper also offers a methodological contribution to parties involved in the art sector (artists, galleries, collectors, investors, museums, etc.).

Keywords Art returns, Hedonic pricing model, Joan Miró, Alternative investments
Paper type Research paper

Resumen

Objetivo – Se conoce relativamente poco acerca de los determinantes de los precios de las obras de arte de artistas específicos. Este estudio analiza los determinantes de los precios de las pinturas de Joan Miró, uno de los grandes maestros del arte moderno.
Diseño/Metodología/Enfoque – Se analizaron 255 pinturas de Miró que fueron vendidas en Sotheby's y Christie's entre 2003 y 2017, y se estimó una regresión hedónica de precios con el objetivo de medir el impacto de una serie de variables en los precios de las obras de este artista.
Hallazgos – Las obras de Miró obtuvieron precios más altos, *ceteris paribus*, cuando estaban puintadas sobre lienzo, se vendieron en Sotheby's y en la ciudad de Nueva York o Londres, se subastaron durante la sesión de la noche, y dependiendo del período en que se pintaron, el tamaño de su área, la cantidad de palabras utilizadas para

JEL Classification — D40, D44, Z11

Academia Revista Latinoamericana de Administración
Vol. 32 No. 3, 2019
pp. 373-391

1012-8255
DOI 10.1108/ARLA-06-2018-0121

describir el lote respectivo y si habían aparecido en un libro de arte. Los precios de las pinturas de Miró aumentaron sustancialmente entre 2003 y 2008 y luego disminuyeron, coincidiendo con la crisis financiera mundial de 2009.
Limitaciones de la investigación/implicaciones – Los resultados se obtuvieron a partir de los precios establecidos en las subastas de arte, los cuales representan solo una porción del mercado.
Originalidad/valor – Este es el primer estudio exhaustivo realizado sobre los determinantes de los precios de las obras de Joan Miró. El artista representa un caso ideal debido a la gran cantidad de sus obras que se han vendido en subastas. Hasta el momento, solo se han realizado estudios de Pablo Picasso y Andy Warhol. Joan Miró tiene períodos artísticos bien definidos, lo que también permitió determinar el impacto que en el precio de las obras podía tener el período en que éstas se crearon. Este trabajo también ofrece una contribución metodológica a las partes involucradas en el sector del arte (artistas, galerías, coleccionistas, inversores, museos, etc.).

Palabras clave Rendimientos del arte, Modelo de precios hedónico, Joan Miró, inversiones alternativas
Tipo de papel Trabajo de investigación

Most economists agree that the prices of artworks reflect, on average, their value and quality (Coslor and Spaenjers, 2016). However, this proposition is still controversial among the general public and art historians (Edwards, 2004).

In recent decades, the international art market has attracted increasing interest from collectors and investors, both individual and institutional. There is an extensive literature on the determinants of art prices, categorised either by style or artistic movement, or looking at the aggregate art market (see e.g. the studies by Baumol, 1986; Goetzmann, 1993; Mei and Moses, 2002; Higgs and Worthington, 2005; Campbell, 2008; Renneboog and Spaenjers, 2013; Garay, 2017; among others). However, we know relatively little about the determinants of art prices for specific artists; the few studies that exist include Biey and Zanola (2005), who studied the factors that affected the prices of Picasso's serigraphs, and the recent studies by Stepanova (2015) that analysed the prices of Picasso's oil paintings, and Pownall and Graddy (2016) who studied the price determinants of Andy Warhol's serigraphs.

The main purpose of this paper is to establish the microeconomic variables that impact the price of a specific artist's works, in this case Joan Miró, one of the great masters of surrealism. This research represents, as far as we have been able to verify, the first study carried out to establish the investment attributes of Joan Miró's artworks. This paper also offers a methodological contribution to parties involved in the art sector (artists, galleries, collectors, investors, museums, etc.) since empirical methods and rigorous measurements such as those presented here are often scant in this sector.

It is important to note that there have been a sufficiently high number of works by this artist traded at auction, which is a necessary condition to carry out this type of study. More specifically, this paper analyses artworks by Joan Miró that were auctioned at Christie's and Sotheby's, the two most dominant auction houses in the world, between 2003 and 2017. A hedonic regression model was estimated in which the dependent variable is the price of each work sold (expressed in natural logarithm) and the independent variables are: area of the painting, whether it is signed and dated, name of the auction house, auction city, auction date, auction time, lot number, style of painting, number of words in the catalogue, whether the artwork has been published in an art book or catalogue and the number of exhibitions in which the work has been featured, among other variables.

The historical performance of investment in Joan Miró's artworks is also estimated. The results of this paper are of great interest both from an academic point of view and from the perspective of those who participate in the art market (galleries, art fairs, art dealers and investors).

The following section presents a review of the literature on the attributes of art as an investment. Afterwards, the data and the methodology followed in the study are explained and the results obtained are analysed. Finally, we present the conclusions, implications and possible extensions to this study.

1. Literature review

This section offers a brief introduction to Joan Miró and a summary of the literature on the attributes of art as an investment.

1.1 Brief introduction to Joan Miró

Surrealism is an artistic movement that began in France in the 1920s with its roots in Dadaism. Surrealists expressed images from their dreams in their art, associating very dissimilar elements and letting thoughts flow freely, with Sigmund Freud, the father of psychoanalysis, as an influential figure. Surrealism gave rise to artworks that were free of restrictions and that are often illogical and grotesque.

In Spain, surrealism also appeared in the 1920s mixed with elements of popular painting and symbolism. In addition to Joan Miró and Salvador Dalí, Spanish surrealism involved many other artists such as Gregorio Prieto, José Moreno Villa, Benjamín Palencia, Maruja Mallo and José Caballero (Boix, 2010).

Joan Miró i Ferrà was born in Barcelona on 20 April 1893, into a family of artisan heritage. They were representative of the Catalan middle class that had emerged post-1875 and the Second Industrial Revolution and had become rentiers, although without losing their peasant roots (Boix, 2010). As well as being a painter, Miró was a ceramist, sculptor and engraver. His work reflects his interest in the "infantile" in Catalonia as an autonomous community and in the subconscious. In numerous interviews and writings from the 1930s, Miró expressed his desire to abandon the conventional methods of painting in order to formulate a form of expression that was contemporary and surreal. The French poet André Breton considered Miró to be the most surrealist of all artists. Several authors have studied the artistic periods of Miró. For example, Dupin (1993) and Bourlier (2013) have catalogued the works of Miró according to his artistic periods. Boix (2010) classifies Miró's artistic periods or stages as follows:

(1) Beginnings, 1893–1915: during this period, the ideological development of Miró constituted the bringing together of conflicting ideas: Secularism and Catholicism, Catalanism and Spanish Nationalism, the Republic and the Monarchy, progressivism and conservatism.

(2) The artist, 1915–1919: after a phase of modernity in which fauvist works prevail (from 1915 to 1917), in 1917 Miró looks towards the European avant-gardes.

(3) The period 1920–1939: this period begins with Miró's first trip to Paris and is divided into two stages: 1920–1929, in which Miró embraced surrealism, and 1930–1939, in which Miró moved towards a "wild" expressionist style. During this two-decade period, Miró got married and lived through the crisis of the 1930s that ended in the Spanish civil war (1936–1939), which was of transcendental importance to Miró. For this 20-year period, the categorisation of styles used in the present study was determined according to Bourlier's (2013) proposal: from 1920 to 1927: Catalan Fauvism, Mutation and Oneiric; from 1929 to 1935: Anti-Painting and Organic; and from 1936 to 1939: Monsters.

(4) The period 1940–1967: this period begins with Miró's return to Spain and is divided into two stages: 1940–1956, which could be defined as internal exile and return to the world, and 1956–1967, the Majorcan stage in which a new language change occurs.

(5) The period 1968–1983: this period is divided into two stages: 1968–1975, in which Miró manifested his inconformity with Franco's regime in various different ways, and 1976–1983, the democratic transition following the death of Franco and the subsequent freedom from Fascism. Miró died on 25 December 1983, in Palma de Mallorca.

It is important to note that Joan Miró is an ideal case for the study of the price determinants of artworks of a specific artist. This is due to the large number of works that Miró created

during his long and prolific life that have been traded in the main auction houses of the world, the great variety of formats he used and the diversity of styles he developed throughout his life, reflected in the periods described above.

1.2 Summary of the literature on the attributes of art as an investment

The poor performance shown by bonds and stocks worldwide since the beginning of the twenty-first century, along with the collapse of financial markets during the 2008–2009 Global Financial Crisis, encouraged investors to explore other investment alternatives, such as investments in hedge funds, commodities, private equities and works of art, among others. Investors have shown increasing interest in art investments (see e.g. Goetzmann, 1993; Campbell, 2008; Mei and Moses, 2002; Renneboog and Spaenjers, 2013; Garay, 2018). The study of art as an investment alternative has also benefited from the growing availability of data and prices of artworks auctioned around the world.

Unlike bonds, stocks and real estate, for example, works of art are a very particular investment asset since, in general, they do not provide income to their owners. In addition, works of art allow collectors to enjoy "aesthetic" benefits, apart from the eventual financial benefits. This leads us to consider artworks as consumer goods (Baumol, 1986); other authors such as Renneboog and Spaenjers (2013) characterize them as "emotional" or "passion" assets.

Academic research on the attributes of art as an investment received a boost in the 1980s with a study by Baumol (1986). Previously, in the 1960s, alongside the boom experienced by the art market that had started in the previous decade, the first price indexes for artworks were designed (see the review presented by Coslor and Spaenjers, 2016).

The two most common methods that have been used to measure the return on art investments are the repeat sales regressions and the hedonic pricing model. The repeat sales regression method considers, for the same work of art, the prices at which a lot has been sold on two or more occasions at auction during a certain period of time (hence the name repeat sales). As it is the same work of art that is being sold, its characteristics remain constant over time. Thus, the main advantage of this method is that it uses a standard point of comparison for all of the works to be studied. However, the main disadvantage is that because it uses the sale prices of the same piece of work, it only considers a small fraction of all the works that have been auctioned over a certain period. Another disadvantage is that the repeat sales method suffers from a selection bias that tends to cause the returns of the art investment to be greater than those actually recorded when measured using this method. The reason for this is that a work of art that is presumed to have increased in price is more likely to appear again for sale at auction, compared to an artwork whose price is presumed to have decreased since it was bought (see Goetzmann, 1993).

Finally, another disadvantage of the repeat sales method is that it is often not possible to determine with complete certainty that a pair or a trio of sales made over time correspond to the same work.

The hedonic pricing model allows for the construction of an art price index when performing an econometric regression in which the dependent variable is the price of each artwork and the independent variables are each of its attributes or characteristics, such as whether the work is signed or dated, area of the painting, technique used, auction year of the work, etc., obtaining an estimated value of each attribute. In addition, from the coefficients of the variable "auction year" it is possible to estimate a price index for the artworks.

The main advantage of this method is that it allows the researcher to use all available information about the transactions contained in a database. Its main disadvantage is that, with this method, the selection of the variables to be used is more complicated, in order that the regression does not present problems and robust results be obtained. According to Rosen (1974), creator of the hedonic pricing model, a series of classes of a heterogeneous

good can be represented by a set of attributes. In addition, there is no specific market for each attribute and, therefore, its price is not directly observable (Bilbao *et al.,* 2015).

It is important to mention that the methodology of hedonic pricing can also be applied to the valuation of alternative investments in public and private goods different from the art market, for example, the real estate market. In this way, Bilbao *et al.* (2015) study the valuation made by the touristic market in the construction of public infrastructure in the city of Gijón, Spain, using the hedonic pricing method.

The hedonic model has also been used for other aesthetic products. For example, Charters (2006) argues that music should be considered an aesthetic product as it frequently creates a spiritually or emotionally moving experience that is specific to an individual, and Lacher and Mizerski (1994) examine whether music generates responses in consumers that lead them to later purchase music. Furthermore, Shepard (2010) uses a hedonic analysis to obtain estimates of the willingness-to-pay for greater access to cultural amenities related to new cultural programming and new cultural organisations.

As was discussed above, Baumol (1986) conducted a pioneering study in which he estimated the return on art investment. The study was carried out using the data contained in a book by Reitlinger (1961) and using the methodology of repeat sales, found that art offered a real return of only 0.6 per cent per year between 1652 and 1961. Goetzmann (1993) extended Baumol's (1986) study up to 1986 and established, also using the method of repeat sales, that the return on art investment exceeded 2 per cent per year at the rate of inflation recorded between 1716 and 1986. This performance was similar to that of bonds but less than that of stocks.

Mei and Moses (2002) used a database of 4,896 repeat sales to create an annual index of art prices between 1875 and 2000, finding that art outperformed fixed income assets, but underperformed the corresponding returns for stocks. Campbell (2008) used semi-annual data from "Art Market Research and Mei Moses" from 1976 to 2002, which is constructed using a 12-month moving average and applies the repeat sales model, and obtained results similar to those of Mei and Moses (2002), concluding that the inclusion of artworks in an investment portfolio helps to reduce its risk. This is because the correlation between the artworks' returns and those of stocks and bonds is low, and that is why art is presented as an effective asset to diversify a portfolio. In addition, Campbell found that art returns are above the rate of inflation and that of government bonds, but below that of stocks.

Korteweg *et al.* (2015) analysed 32,928 works that were repeatedly sold during the period 1960–2013, and found that the apparent performance offered by artworks reduced from 8.7 per cent per annum to 6.3 per cent per annum because of the selection bias of the repeat sales method, according to which the works that are presumed to have gone up in price are more likely to be offered at auction compared to those which the seller surmises that their prices may have declined since the painting was bought.

Goetzmann *et al.* (2011) studied how the income of the wealthiest people in society and the returns of stocks and bonds influence art prices, finding that the latter increase when the distribution of income becomes more unequal and responds to an annual lag in stock prices. The authors used the data collected in the book by Gerard Reitlinger (1961) and updated it, to later apply the repeat sales regression and to elaborate an annual index in real sterling pounds from 1830 to 2007.

Higgs and Worthington (2005) investigated the determinants of art prices in the Australian art market by creating a price index for the period 1973–2003 using the hedonic pricing method, considering a total of 37,605 artworks from 60 recognised Australian artists, sold at the main auction houses of Australia and around the world. The variables (attributes) considered by Higgs and Worthington in the hedonic price regression include the name of the artist, whether the artist was alive or had already died at the time of the auction, the auction house, the technique used, whether the work was signed, its dimensions and the year it was sold. The authors found that the annual nominal return of Australian art

was 6.96 per cent (in Australian dollars) with a standard deviation of 16.51 per cent. The regression suggests that variables such as the name of the artists, or the fact that they had died before the auction was held, increased the value of the works, as well as those works that were painted in oils or acrylics. Likewise, it was found that the artworks sold at Sotheby's or Christie's commanded higher prices.

Renneboog and Spaenjers (2013) also used the hedonic pricing method and analysed a database of more than 1m sales of paintings in auction houses around the world between 1957 and 2007. The authors found that the prices of the works were determined by their size, the technique used, whether they were signed or dated, the topic of the work and the place where they were auctioned, among others. This is the largest study carried out to date, since it considers more than 1m transactions and more than 10,000 artists. The authors found that art offered an annual real return in dollars of 3.97 per cent, which was similar to that of bonds, but with a much higher risk. In addition, they determined that the correlation between the returns on art and financial assets is quite low or even negative. Also, the correlation of art to gold, commodities and real estate is low. The study also presented the following specific conclusions:

- the signed and dated works were sold at prices that were approximately 31 and 19 per cent higher, respectively, than the works that were not;
- prices increase with the increase in size of the work to a certain point where it becomes too large and the price begins to fall;
- works of art increase in value by 13.5 per cent after the artist is incorporated into an important reference book of art history;
- the style and technique used affect the price of the work, oil being the most expensive;
- the month in which a piece is auctioned has an influence on its price, May and November being the months with the highest prices (the most important auctions at Christie's and Sotheby's are usually carried out during these months);
- higher prices are paid when artworks are sold at the auction houses Christie's and Sotheby's; and
- the authors found that Pop Art has performed better than other movements such as Cubism or Rococo in recent years.

Finally, in a more recent study, Stepanova (2015) determined that works of art that have a greater colour intensity tend to have higher prices. For this, she used data about paintings by Pablo Picasso sold at Christie's and Sotheby's auction houses between 1998 and 2014. Stepanova found that there was a strong correlation between the price of Picasso's paintings and the surface occupied by blue and orange colours. While orange colours increased the price of the work by 50 per cent compared to other tones, blue colours increased the price by 21 per cent.

In that study, Stepanova also determined that the works sold in the evening auction session (when the auctions most eagerly awaited by collectors and investors take place) tend to be more expensive than those sold during morning auctions. Stepanova (2015) also found that Picasso's works commanded higher prices, *ceteris paribus*, when the surface area was larger and whether they had appeared in art books. Likewise, of the eight artistic periods of Picasso, only the works belonging to the Blue and Pink period (1902–1906) were statistically more expensive than those belonging to the period excluded in the regression of the study (Childhood and Youth, 1881–1901). In addition, the following variables were not significant: whether the work was signed, whether it was dated, whether it was painted on canvas (compared to wood), whether the work was auctioned at Sotheby's compared to Christie's or that it had been previously exhibited in museums or galleries.

The following studies have also applied the hedonic pricing method to measure art investment returns: Buelens and Ginsburgh (1993), Agnello and Pierce (1996), Taylor and Coleman (2011), Garay *et al.* (2017) and Garay (2017). Tables I (repeat sales) and II (hedonic pricing), which have been adapted from Garay (2018), show the results reported in the literature regarding the risk and return of investment in artworks. The following general conclusions can be drawn:

(1) Most of the studies carried out analyse the artworks' performance by studying price indices for countries or artistic movements. There are few studies dedicated to analysing the investment attributes of the works of artists considered individually (these include the study by Pesando and Shum (1996), on Picasso's prints; the recent studies by Stepanova (2015), on Picasso's paintings; and Pownall and Graddy (2016), on Andy Warhol's serigraphs).

(2) The real rate of art return has been positive in almost all cases, and relatively moderate. Those cases in which art returns were reported in nominal terms, it was evidenced that these were also positive in real terms, although in many cases they were only slightly positive.

(3) In almost all the studies, the recorded return of art investments has been lower than that of stocks and, frequently, similar to that of government bonds, although with a higher level of risk than that of bonds which is similar to that of stocks.

Table III, also adapted from Garay (2018), shows the risk and return of art investments by styles/movements that have been reported in the literature. All the studies of art

Author(s)	Market(s)/Style(s)	Time frame	Annual real return (%)	SD (%)
Baumol (1986)	General	1652–1961	0.60	
Frey and Pommerehne (1989)	General	1635–1949	1.40	
		1653–1987	1.50	5.00
		1950–1987	1.70	
Buelens and Ginsburgh (1993)	General	1780–1970	3.00	
Goetzmann (1993)	General	1716–1986	2.00	
		1850–1986	3.80	6.50
		1900–1986	13.30	5.19
Pesando (1993)	Modern prints	1977–1992	1.51	19.94
Chanel *et al.* (1996)	General	1855–1969	5.00	
Goetzmann (1996)	General	1907–1977	5.00	
Pesando and Shum (1996)	Picasso's prints	1977–1992	2.10	23.38
Mei and Moses (2002)	USA, Impressionism and Great Old Masters	1875–1999	4.90	4.28
		1900–1986	5.20	3.72
		1900–1999	5.20	3.55
		1950–1999	8.20	2.13
		1977–1991	7.80	2.11
Renneboog and Spaenjers (2013)	General	1982–2007	4.56	15.79
Korteweg *et al.* (2015)	General	1961–2013	6.28 (Nominal return)	11.35

Note: Returns and SD are as reported by the authors
Source: Taken and adapted from Garay (2018)

Table I. Summary of art as an investment in studies that used the repeat sales method

Table II.
Summary of art as an investment in studies that used the hedonic pricing method

Author(s)	Market(s)	Time frame	Annual return	SD (%)
Agnello and Pierce (1996)	USA	1971–1992	9.30% (nominal dollars)	–
Renneboog and Van Houtte (2002)	Belgium	1970–1989	8.40% (nominal Belgian francs)	19.40
Higgs and Worthington (2005)	Australia	1973–2003	6.96% (nominal Australian dollars)	16.51
Taylor and Coleman (2011)	Australian Aboriginal Art	1982–2007	6.60% (nominal Australian dollars)	17.90
Kraeussl and Logher (2010)	Russia	1985–2008	10.00% (nominal dollars)	26.53
	China	1990–2008	5.70% (nominal dollars)	21.08
	India	2002–2008	42.20% (nominal dollars)	36.87
Renneboog and Spaenjers (2013)	World	1957–2007	3.97% (real dollars)	15.21
Korteweg *et al.* (2015)	General	1960–2013	8.72% (nominal dollars)	13.76
Renneboog and Spaenjers (2014)	Australia	1971–2007	3.09% (real dollars)	21.15
	Austria	1971–2007	2.53% (real dollars)	17.44
	Belgium	1975–2007	−0.90% (real dollars)	17.41
	Canada	1972–2007	2.36% (real dollars)	16.12
	Denmark	1976–2007	1.75% (real dollars)	15.56
	France	1971–2007	1.14% (real dollars)	18.94
	Germany	1971–2007	1.52% (real dollars)	13.12
	Italy	1971–2007	1.99% (real dollars)	17.67
	Netherlands	1971–2007	2.30% (real dollars)	17.94
	Sweden	1971–2007	2.32% (real dollars)	20.18
	Switzerland	1972–2007	1.99% (real dollars)	18.50
	Great Britain	1971–2007	4.60% (real dollars)	15.79
	USA	1971–2007	3.07% (real dollars)	14.31
Edwards (2004)	Latin America	1981–2000	9.00% (real dollars)	12.60
Campos and Barbosa (2009)	Latin America	1995–2002	5.23% (nominal dollars)	–
Kräussl *et al.* (2016)	Latin America	1970–2013	6.11% (nominal dollars)	–
Garay *et al.* (2017)	Argentina	1980–2014	6.81% (nominal dollars)	29.11

Note: Returns and SD are as reported by the authors
Source: Taken and adapted from Garay (2018)

Author(s)	Art Style/Movement	Annual return (%)	SD (%)	Annual return (%)	SD (%)
Renneboog and Spaenjers (2013)	(Real dollars)	1957–2007		1982–2007	
	Medieval and Renaissance	3.01	27.13	6.44	19.59
	Baroque	4.76	17.69	5.82	12.57
	Rococo	3.69	25.42	5.03	12.15
	Neoclassicism	6.32	45.93	5.36	22.45
	Romanticism	4.28	17.34	4.79	15.24
	Realism	2.57	21.42	4.16	15.46
	Impressionism and Symbolism	4.10	24.01	4.55	16.70
	Fauvism and Expressionism	3.72	22.84	4.90	18.36
	Cubism, Futurism and Constructivism	5.53	22.40	6.01	20.55
	Dadaism and Surrelism	5.85	32.32	5.58	19.42
	Abstract Expressionism	–	–	7.78	21.91
	Pop	–	–	10.35	29.33
	Minimalism and Contemporary Art	–	–	7.07	23.68
Korteweg *et al.* (2015)	(Nominal dollars)	1961–2013			
	Post-war and Contemporary Art	7.43	11.63		
	Impressionist and Modern Art	6.09	13.30		
	Old Masters	4.56	13.75		
	American Artists	6.83	10.28		
	European Artists - 19th century	6.81	11.70		
	Other styles	6.53	13.92		
	Top 100 artists	9.50	13.86		
Edwards (2004)	(Real dollars)	1981–2000			
	Latin America	9.00	12.60		
Campos and Barbosa (2009)	(Nominal dollars)	1995–2002			
	Latin America	5.23	–		
Kräussl *et al.* (2016)	(Nominal dollars)	1970–2013			
	Latin America	6.11	–		

Note: Returns and SD are as reported by the authors
Source: Taken and adapted from Garay (2018)

Table III.
Summary of art as an investment by style/movement

styles/movements that were found are based on the hedonic pricing model because the repeat sales method only allows for the consideration of a small sample of the universe of works traded at auction.

2. Data and methodology

There are different channels through which it is possible to acquire works of art, such as auction houses, galleries and dealers. For this study, we use information that refers to the sales of artwork at auctions, since these constitute the only public and systematic sources of artwork pricing. Likewise, we use data on works by Joan Miró sold at auction for the period 2003–2017. The source of this information is the websites of Christie's and Sotheby's auction houses, which are the two most prestigious auction houses worldwide. All available data were collected from the respective auction houses' websites (www.sothebys.com and www.christies.com), and complemented by information from the Blouin Art Sales database. Data collection from these sources identified a total of 255 paintings in oil, oil and mixed media and other techniques. We decided to concentrate the study on works in these three categories to keep the sample as homogeneous as possible in terms of the technique used, also taking into consideration the relatively high number of works in oil and in oil and

mixed media that were auctioned during the study period. Sculptures were excluded (for a study of the price determinants of sculptures see Vosilov, 2015), as well as lithographs and works made using multiple techniques. The hedonic regression model was estimated using the ordinary least squares method. As previously mentioned, the hedonic pricing method assumes that the price of an artwork is equal to the sum of the prices of its characteristics or attributes. Among these attributes are, for example, the size of the work, whether the work is signed and dated, etc. (there follows a list of attributes considered). The combination of all the sales made allows for the obtention of the implicit (or hedonic) prices of the artworks. The regression by means of which the model was estimated is as follows:

$$\ln P_{kt} = \alpha + \sum_{m=1}^{M} \beta_m x X_{mkt} + \sum_{t=1}^{T} Y_t x D_{kt} + \varepsilon_{kt}, \quad (1)$$

where $\ln P_{kt}$ is the price, in natural logarithm, of painting k auctioned at year t (including the "buyer's premium" or commission). It is the dependent variable of the model and it is expressed in nominal dollars, X_{mkt} the value of the attribute m of artwork k auctioned at year t, D_{kt} the dummy variable that takes the value of 1 if artwork k is sold in year t and 0 otherwise, β_m the price of attribute m, Y_t the coefficient with respect to the year-dummy variable (these coefficients are used to estimate the value of the hedonic price index in each year t).

The list of the attributes considered in the regression model is as follows:

- Technique used: works of art are classified as having been created using any of the following techniques (dummy variables): oil only, oil and others, and other techniques.
- Support: whether the work was painted on canvas or using another support.
- Auction house: whether the work was auctioned at Christie's or Sotheby's.
- Auction city: whether Miró's artworks were auctioned in New York, London, Paris or Madrid.
- Auction time: used to study the impact of a sale in the mostly night-time main auction events, or in the mostly daytime secondary events, on the price of the artwork.
- Dated: to identify whether the work is dated or not.
- Signed: to identify whether the work is signed or not.
- Area: to consider the artworks' measurements in inches (height by width).
- Area squared: used to evaluate whether the prices of artworks increase at a decreasing or at an increasing rate as the size increases.
- Auction lot number: included to analyse whether the order in which the lot was auctioned during the session affected its price.
- Auction lot number squared: used to evaluate whether the prices of artworks increase at a decreasing rate as the auction lot number increases.
- References in the literature: the number of times the work had previously been mentioned in art books or art catalogues.
- Exhibitions: the number of times the work had been exhibited in galleries, art halls and museums.
- Provenance: the number of owners the artwork had had at the time of the auction.
- Number of words used to describe the lot in the catalogue: the greater the number of words, the greater the importance of the work, at least in the opinion of the auction house.

- *Catalogue raisonné:* whether the work appears in the *catalogue raisonné* or inventory of all the artist's works.
- Certificate of authenticity: whether the work has been certified by an expert.
- Artistic period: the date on which the work was created is evaluated to assign it to the period of Miró's artistic life to which it belongs. As mentioned above, Miró's artistic periods are the following (periods until 1939 are based on Bourlier (2013), and are subsequently based on Boix (2010): until 1919: beginnings; 1920–1927: Catalan Fauvism, Mutation and Oneiric; 1929–1935: anti-painting and organic; 1936–1939: monsters; 1940–1967: internal exile and Majorcan stage; 1968–1975: against Francoism; and 1975–1983: transition to democracy.
- Year of the auction: the year in which the auction was carried out is considered. The value of the coefficient obtained from the regression is used to elaborate a price index of Joan Miró, similar to the process carried out by Higgs and Worthington (2005), Renneboog and Spaenjers (2013) and Garay (2017).

3. Analysis of results

Table IV shows the descriptive statistics of this study. The average sale price (including the buyer's premium) of the 255 Miró paintings that constitute our sample was $2,414,736 with a relatively high standard deviation of $4,445,636. The majority of the works were signed and dated by Miró (95 and 97 per cent, respectively). The table also shows that 163 of them were painted in oil, 81 in oil and mixed media and only 11 with other techniques. Of the 255 works, 148 were painted on canvas, while the average area of the works was 933.46 square inches (with a high standard deviation of 1,123.77 square inches, due to the fact that Miró made his artworks in a great variety of formats throughout his life).

On average, the works in the sample had 3.38 owners (provenance), had been exhibited in 1.86 exhibitions (galleries or museums), had been mentioned 2.13 times in books or art catalogues and had on average 514.52 words in the catalogue note that described the work in the respective auction. The table also shows that the most expensive works are those belonging to the period "Catalan Fauvism, Mutation and Oneiric" (1920–1927), followed by those belonging to the period "Anti-Painting and Organic" (1929–1935).

Table V shows the regression results. First, the R^2 of the regression was quite satisfactory (0.84), which indicates that the price of Miró's works is explained 84 per cent of the time by the variables or attributes selected. The coefficients of variables "signed" and "dated" were not significant. These results, apparently contradictory, are nonetheless consistent with those found by Stepanova (2015) for Picasso, and Campos and Barbosa (2009) for Latin American art. Possibly, the fact that the great majority of works have been signed and dated by Miró (95 and 97 per cent, respectively) does not allow for the analysis to discriminate the effect of these variables on the price of the paintings. In addition, the fact that the works are signed and dated adds, in principle, an element of authenticity to the works. However, the fact that they are very high-quality artworks (since they have been sold at Sotheby's and Christie's, the two most prestigious auction houses in the world), this element of authenticity may not be as important. This variable may be more relevant for lower-price works sold at other auction houses.

Artwork prices increase 0.04 per cent for each additional square inch of area and this rate is decreasing (reflected in the negative and significant coefficient of the variable Area squared). This result is consistent with that found in the existing literature (see e.g. Renneboog and Spaenjers, 2013; Garay, 2017). The lot number has a positive coefficient, although the *p*-value was only 0.129. This result suggests that art prices increase as the auction progresses (from the first to the last lot), and the positive and significant coefficient for the variable "lot number squared" indicates that this hike in prices occurs at an

Variable	Number of paintings	Joan Miró Arithmetic mean	SD	Min.	Max.
Price	255	$2,414,736	$4,445,636	$42,781	$36,946,396
Technique and support					
Oil	163	$3,050,366	$5,146,751	$99,304	$36,946,396
Oil and others	81	$1,275,300	$2,464,873	$42,781	$14,866,500
Others	11	$1,386,239	$2,450,406	$105,522	$8,360,265
Canvas	148	$3,603,129	$5,425,884	$102,096	$36,946,396
Paper	38	$550,809	$503,194	$42,781	$2,772,500
Others	69	$892,228	$1,635,597	$98,374	$12,485,000
Characteristics of the auction					
Christie's	148	$2,542,170	$4,486,708	$88,169	$26,609,175
Sotheby's	107	$2,238,471	$4,403,104	$42,781	$36,946,396
New York	112	$2,678,440	$4,003,262	$102,000	$23,375,000
London	126	$2,432,470	$5,035,464	$88,169	$36,946,396
Paris/Madrid	17	$545,950	$523,851	$42,781	$2,040,316
Evening	156	$3,689,978	$5,303,243	$42,781	$36,946,396
Characteristics of the lots					
Dated	247	$2,453,503	$4,506,164	$42,781	$36,946,396
Signed	241	$2,500,867	$4,551,700	$42,781	$36,946,396
Area (inches^2)	–	933.46	1,123.77	24.98	8,521.83
Lot number	–	162.20	165.06	3	711
Number of references in literature	–	2.13	2.69	0	30
Number of exhibitions	–	1.86	2.90	0	18
Provenance (number of owners)	–	3.38	1.92	0	13
Number of words	–	514.52	577.40	0	3,104
Catalogue Raisonné	203	$2,692,338	$4,711,677	$47,073	$36,946,396
Certificate of Authenticity	49	$1,195,409	$2,678,140	$42,781	$17,065,000
Artistic period					
Beginnings	6	$2,032,620	$3,260,815	$464,000	$8,677,000
Catalan Fauvism, Mutation and Oneiric	26	$4,995,048	$8,494,655	$152,176	$36,946,396
Anti-Painting and Organic	18	$3,698,715	$6,362,032	$108,000	$23,375,000
Monsters	14	$3,627,307	$5,390,919	$142,400	$17,065,000
Internal Exile and Majorcan Stage	113	$2,263,488	$3,665,076	$42,781	$23,540,828
Against Francoism	48	$1,705,786	$2,207,050	$88,169	$8,360,265
Transition to Democracy	30	$622,651	$748,082	$98,374	$2,909,000

Notes: The sample consists of all paintings by Joan Miró that were sold at Christie's and Sotheby's between 2003 and 2017 (255 lots). Technique is the medium used to create the painting. Support examines whether the painting was painted on canvas or on another support. Lots were sold at the evening and day auctions held at Christie's and Sotheby's, and in the cities of New York, London, Paris and Madrid. Characteristics of the lot include: whether the artwork was signed and dated by Joan Miró, the area (height multiplied by width), area squared, the number of the lot at the auction, the number of the lot at the auction squared, the number of times the work had been mentioned in art books or art catalogues (literature), the number of times the work had been exhibited in galleries, art halls and museums (exhibitions); the number of owners the artwork had had up to the time of the auction (provenance), the number of words used to describe the lot in the catalogue, whether the work appears in Miró's *catalogue raisonné*, and whether the work had a certificate of authenticity issued by an art expert. Artistic periods were defined by Boix (2010). Year of the auction corresponds to the year in which the lot was sold

Source: Authors' calculations based on information obtained from Christie's, Sotheby's and Blouin Art Sales websites

Table IV.
Descriptive statistics

increasing rate. This is consistent with the most expensive paintings being located towards the middle and the end of the auction session.

Regarding the technique used, no significant results were obtained. This is not surprising, since 96 per cent of the works analysed in this study were painted in oil or in oil

Variable	Coefficient	SE	t	$P > \|t\|$	Price impact (%)
Technique and support					
Oil	0.3149	0.3058	1.03	0.304	
Oil and others	0.2818	0.2863	0.98	0.326	
Others	0.0000		Omitted		
Canvas	0.3513	0.1011	3.48	*0.001*	42.10
Characteristics of the auction					
Sotheby's	0.3539	0.0946	3.74	*0.000*	42.46
New York	1.1537	0.2425	4.76	*0.000*	217.00
London	1.0675	0.2328	4.59	*0.000*	190.80
Paris/Madrid	0.0000		Omitted		
Evening	0.7139	0.1855	3.85	*0.000*	104.20
Characteristics of the lots					
Dated	0.0155	0.3422	0.05	0.964	
Signed	−0.1307	0.1824	−0.72	0.474	
Area (inches^2)	0.0004	0.0001	4.31	*0.000*	0.04
Area squared (Inches^4)	−2.98E−08	1.33E−08	−2.25	*0.026*	0.00
Lor number	−0.0021	0.0014	−1.52	0.129	
Lot number squared	3.57E−06	1.87E−06	1.91	*0.057*	
Number of references in literature	0.0397	0.0155	2.55	*0.011*	4.05
Number of exhibitions	−0.0237	0.0165	−1.44	0.151	
Provenance (number of owners)	−0.0155	0.0230	−0.67	0.502	
Number of words	0.0011	0.0001	11.34	*0.000*	0.11
Catalogue Raisonné	−0.0100	0.1471	−0.07	0.946	
Certificate of Authenticity	−0.1160	0.1323	−0.88	0.382	
Artistic period					
Beginnings	−0.5562	0.2361	−2.36	*0.019*	−42.66
Catalan Fauvism, Mutation and Oneiric	−0.4099	0.2123	−1.93	*0.055*	−33.63
Anti-Painting and Organic	0.0000		Omitted		
Monsters	−0.4708	0.2446	−1.92	*0.056*	−37.55
Internal Exile and Majorcan Stage	−0.2920	0.1585	−1.84	*0.067*	−25.32
Against Francoism	−0.2077	0.1754	−1.18	0.238	
Transition to Democracy	−0.4943	0.1887	−2.62	*0.009*	−39.00
Year of the auction					
2003	0.0000		Omitted		
2004	0.3878	0.2682	1.45	0.150	
2005	0.6793	0.2744	2.48	*0.014*	97.25
2006	0.7500	0.3025	2.48	*0.014*	111.70
2007	0.7650	0.2810	2.72	*0.007*	114.91
2008	0.9221	0.2784	3.31	*0.001*	151.46
2009	0.6208	0.2827	2.20	*0.029*	86.04
2010	0.6747	0.2737	2.47	*0.014*	96.34
2011	0.4320	0.3326	1.30	0.195	
2012	0.6741	0.2690	2.51	*0.013*	96.22
2013	0.3777	0.2808	1.35	0.180	
2014	0.5661	0.2662	2.13	*0.035*	76.14
2015	0.9121	0.3048	2.99	*0.003*	148.94
2016	0.2310	0.3886	0.59	0.553	
2017	0.3466	0.3385	1.02	0.307	
Constant (intercept)	1.0800	0.6011	17.97	0.000	

Notes: $n = 255$; $R^2 = 0.8369$. In the hedonic model, the price impact is measured as: $e^{\beta m} - 1$. The β_m coefficients of the dummy variables in the previous expression are interpreted following Halvorsen and Palmquist (1980). This table reports results from the hedonic regression using Equation (1) on paintings by Joan Miró sold at Christie's and Sotheby's between 2003 and 2017 (255 lots). Technique is the medium used to create the painting. Support examines whether the painting was painted on canvas or on another support. Lots were sold at the evening and day auctions held at Christie's and Sotheby's, and in the cities of New York, London, Paris and Madrid. Characteristics of the lot include: whether the artwork was signed and dated by Joan Miró, the area (height multiplied by width), area squared, the number of the lot at the auction, the number of the lot at the auction squared, the number of times the work had been mentioned in art books or art catalogues (literature), the number of times the work had been exhibited in galleries, art halls and museums (exhibitions); the number of owners the artwork had had up to the time of the auction (provenance), the number of words used to describe the lot in the catalogue, whether the work appears in Miró's *catalogue raisonné* and whether the work had a certificate of authenticity issued by an art expert. Artistic periods were defined by Boix (2010). Year of the auction corresponds to the year in which the lot was sold

Source: Authors

Table V.
Hedonic regression results and price impact

and other techniques. We found evidence (Higgs and Worthington, 2005; Renneboog and Spaenjers, 2013; Garay, 2017) that works painted in oil tend to be worth more, *ceteris paribus*, than those created using watercolours, pastel, ink and pencil, among others. Oil is a more expensive technique, more durable and more difficult for the artist to master (compared to other techniques), and hence the market tends to assign greater value to works painted using this technique.

The artworks painted on canvas are worth 42.10 per cent more than the works painted on other supports. This result is very interesting, and our study is the first to document, as far as we have seen, the importance of the support of a work on its price, for example, and as commented above, Czujack (1997) and Stepanova (2015) did not find significant price differences between works painted on canvas or on a wooden support in the case of Picasso. Presumably, a work painted on canvas can better withstand the passage of time than a work painted on paper, even if that paper is placed on top of a canvas. The works auctioned in the evening sale of both auction houses are worth 104.20 per cent more than those sold in the morning or afternoon session. The evening sale is considered the star auction of both auction houses, so this finding is not a surprise. This result is consistent with that reported by Stepanova (2015) in his study of the price determinants of Pablo Picasso's works. In our case, Miró's works sold at Sotheby's are worth 42.46 per cent more than those sold at Christie's. This result is striking since, in general, in the literature it has been found that the prices of the works of different artists sold in both auction houses tend to be very similar, *ceteris paribus*.

Miró's works of art sold in New York and London are more expensive than those sold in Paris or Madrid. Indeed, Table VI shows that the 25 most expensive paintings by Miró were sold in either New York or London (in fact, the most expensive painting by Miró sold in either Paris or Madrid occupies spot number 68 in the list, although it is also important to bear in mind that only 17 of the 255 paintings by Miró were sold in either of those two cities). And, consistent with these findings, the paintings sold in New York City and London were, on average, 217 and 191 per cent more expensive than those sold in either Madrid or Paris, the dummy variable that was omitted from the regression (see the price impact column).

The variables "authenticated", "provenance" and "*catalogue raisonné*" can be considered variables that measure a work's authenticity. As explained above, the fact that the works considered in this study have been sold in the two most prestigious auction houses in the world could have caused these variables not to be significant. The variable "exhibited" was not significant either (as was similarly found by Stepanova (2015), in the case of Picasso). On the other hand, the variable "literature" was significant. This result is consistent with what was reported by Stepanova (2015) in the case of Picasso. It seems that the market pays particular attention to this variable, as well as to the number of words that have been dedicated to it in the catalogue of the auction house when describing the respective lot.

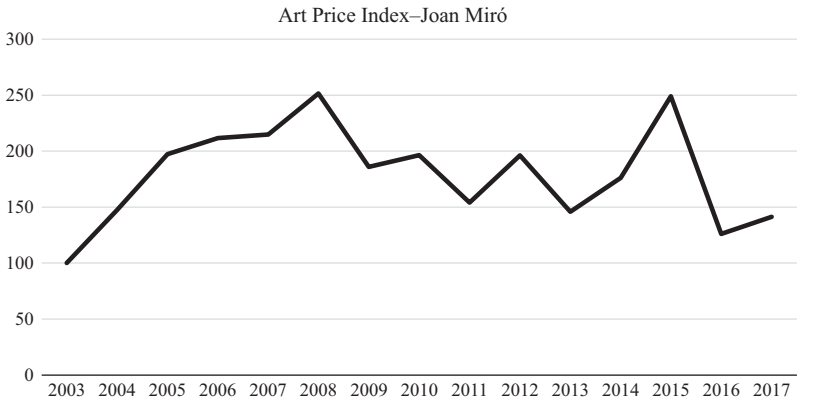
With respect to the artistic periods, the works painted during the Anti-Painting and Organic period (1929–1935), which was omitted from the regression, were statistically more expensive than works made during all other periods (until 1919: beginnings was 43 per cent less expensive, according to the price impact column; 1920–1927: Catalan Fauvism, Mutation and Oneiric was 34 per cent less expensive; 1936–1939: monsters was 38 per cent less expensive; 1940–1967: Internal Exile and Majorcan Stage was 25 per cent less expensive; and 1975–1983: transition to democracy was 39 per cent less expensive), except those painted during the period from 1968 to 1975: against Francoism. These results highlight the importance of considering artists' works, in this case Miró's, according to the period in which they were painted. In the case of Picasso, studied by Stepanova (2015), the author found that only one of the eight periods of the Spanish artist was statistically more expensive than the period omitted from the regression.

Figure 1 shows the evolution of the price index of Joan Miró between 2003 and 2017. The index was constructed from the coefficients of the dummy variables corresponding to

Table VI.
Top 25 paintings by Miró by price

No.	Price ($)	City	Date	Height (inches)	Width (inches)	Work title
1	36,946,396	London	19 June 2012	45.63	35.00	Peinture (étoile bleue)
2	26,609,175	London	7 February 2012	51.25	38.00	Painting-poem*
3	23,540,828	London	4 February 2015	44.88	57.50	Painting (women, moon, birds)
4	23,375,000	New York	13 November 2017	51.13	63.75	Peinture
5	17,065,000	New York	6 June 2008	23.75	28.88	La caresse des étoiles
6	14,866,500	New York	2 May 2012	32.00	25.75	Têtehumaine
7	13,869,068	London	4 February 2015	35.38	45.75	L'oiseau au plumage déployé vole vers l'arbre argenté
8	13,746,500	New York	7 November 2012	36.25	28.75	Peinture (femme, journal, chien)
9	13,281,463	London	5 February 2013	57.50	44.88	Femme rêvant de l'évasion
10	12,485,000	New York	6 May 2014	41.25	29.50	Le serpent à coquelicots traînant sur un champ de violettes peuplé par des lézards en deuil
11	12,263,265	London	24 June 2015	31.88	25.63	Peinture
12	11,767,500	New York	3 November 2004	22.50	28.50	La caresse des étoiles
13	10,987,750	New York	8 May 2013	57.75	45.00	Peinture
14	10,330,500	New York	3 November 2010	21.63	18.13	L'air
15	9,770,000	New York	5 May 2015	23.63	31.88	L'oiseau encerclant d'or étincelant la pensée du poète
16	9,030,000	London	7 February 2006	35.00	45.63	L'oiseau au plumage déployé vole vers l'arbre argenté
17	8,677,000	New York	5 November 2014	25.63	32.00	Tuilerie à Mont-roig
18	8,608,988	London	4 February 2015	30.00	38.00	L'oiseau s'envole vers la zone où le duvet pousse sur les collines encerclées d'or
19	8,440,000	New York	8 May 2007	51.13	38.13	Peinture (le cheval de cirque)
20	8,360,265	London	2 February 2016	63.75	51.13	Femme et oiseaux dans la nuit
21	8,048,701	London	9 February 2012	36.25	29.00	Personnages et oiseaux devant le soleil
22	8,005,000	New York	7 May 2014	36.00	47.88	Sans titre
23	7,765,375	London	24 June 2014	51.13	76.50	Femme à la voix de rossignol dans la nuit
24	7,744,000	New York	1 November 2005	29.88	37.75	Le soleil rouge ronge l'araignée
25	7,709,608	London	22 June 2011	51.13	76.75	Femme à la voix de rossignol dans la nuit

Notes: Top 25 paintings by Joan Miró sold at Christie's and Sotheby's between 2003 and 2017 (255 lots), ordered by price. The title of the poem is: "Le corps de ma brune puisque je l'aime comme ma chatte habillée en vert salade comme de la grêle c'est pareil"
Source: Christie's and Sotheby's Websites



Source: Authors' calculations based on information obtained from Christie's, Sotheby's and Blouin Art Sales websites

Figure 1.
Evolution of Joan Miró's art price index (2003–2017)

each of the years of study in the regression presented in Table V, performing the calculation e^{Yt} for each of the estimated coefficients Y_t. It can be seen that the prices of Miró's works increased substantially between 2003 and 2008 (150 per cent increase) and then experienced a considerable drop in 2009, in the context of the global financial crisis. Prices recovered in 2014 and 2015 but fell again in 2016.

Finally, we carried out the variance inflation test (VIF) to check whether there were multicollinearity problems in the regression. The result obtained was 4.74 which indicates that there is apparently no problem of multicollinearity in the regression.

Finally, an analysis was carried out to establish whether the place where Miró signed and dated his works affected their prices (front, back, on both sides or on the edge of the artwork). None of these variables were significant, which concludes that the place where the work was signed or dated does not affect its price. We also tested whether the name of the auction affected the price (e.g. "Impressionist & Modern Art", etc.), without obtaining evidence in favour of this hypothesis[1].

4. Conclusions and possible extensions

Most of the studies referring to the attributes of art as an investment are based on the construction of price indices of artists from certain countries or artistic movements. However, we know relatively little about the investment attributes of the works of specific artists (except for the cases of Pablo Picasso and Andy Warhol, the two artists with the highest value artworks traded in auction houses annually).

We ran a hedonic regression model for artworks by Joan Miró sold at Christie's and Sotheby's between 2003 and 2017 and found that Miró's paintings are worth more when: they are painted on canvas, are sold at Sotheby's and in New York or London, they are sold in the evening auction, their area is greater, whether they have appeared in books or art catalogues, and when the number of words used to describe the respective lot in the auction catalogue is greater. Works belonging to every other period were less expensive than those belonging to the period "Anti-Painting and Organic" that was omitted in the regression (except the period "Against Francoism"). Compared to the repeat-sales method, the hedonic method has an advantage in that it can be used when the sample size is small, and it does not have the upward bias that has been documented for the repeat-sales method. However, the hedonic method may be problematic in that not all the attributes that potentially influence the price of an artwork may be observable.

This work can be extended by analysing whether the effect of the colour of Miró's artworks affects their prices. For example, in a recent paper, Pownall and Graddy (2016) analysed the impact of the intensity and luminosity of colour on the prices of Andy Warhol's serigraphs sold at Christie's and Sotheby's in 2012. The authors found that the works that had more intense colours tended to attract higher prices, once they controlled by a series of variables. Darkness was rewarded with a premium with respect to lightness. Also, Stepanova (2015) analysed the works of Pablo Picasso sold at Christie's and Sotheby's between 1998 and 2014 and determined that artworks that had a greater contrast of colours were sold at higher prices, and that those containing certain ranges of blue and orange also tended to be sold at higher prices.

Finally, a further study could examine the effect of economic variables (e.g. world or US GDP growth, world or US inflation rate, changes in the dollar index, etc.) on the prices of specific artists such as Miró.

Note

1. These results were not reported in this paper to facilitate the presentation of results but can be sent to interested readers upon request.

References

Agnello, R.J. and Pierce, R.K. (1996), "Financial returns, price determinants, and genre effects in American art investment", *Journal of Cultural Economics*, Vol. 20 No. 4, pp. 359-383.

Baumol, W.J. (1986), "Unnatural value: or art investment as a floating crap game", *American Economic Review*, Vol. 76 No. 2, pp. 10-14.

Biey, M.L. and Zanola, R. (2005), "The market for Picasso prints: a hybrid model approach", *Journal of Cultural Economics*, Vol. 29 No. 2, pp. 127-136.

Bilbao, C., González, A. and Rodríguez, A. (2015), "Valoración hedónica de la creación de un bien público local: un modelo para mercados no competitivos", *Revista de Economía Aplicada*, Vol. XXIII No. 67, pp. 45-61.

Boix, A. (2010), "Joan Miró: El Compromiso de un Artista, 1968-1983", PhD thesis, Director: Catalina Cantarellas, Departamento de Ciencias Históricas y Teoría del Arte, Universitat de les Illes Balears, Palma de Mallorca.

Bourlier, C. (2013), "Joan Miro was a complex and prolific artist who worked in a range of styles and media", Artnet, Berlin, 12 June, available at: https://news.artnet.com/market/an-introduction-to-joan-Miró-32863 (accessed 31 August 2019).

Buelens, N. and Ginsburgh, V. (1993), "Revisiting Baumol's 'art as a floating crap game'", *American Economic Review*, Vol. 76 No. 7, pp. 10-14.

Campbell, R.A.J. (2008), "Art as a financial investment", *The Journal of Alternative Investments*, Vol. 10 No. 4, pp. 64-81.

Campos, N. and Barbosa, R.L. (2009), "Paintings and numbers: an econometric investigation of sales rates, prices, and returns in Latin American art auctions", *Oxford Economic Papers*, Vol. 61 No. 1, pp. 28-51.

Chanel, O., Gérard-Varet, L. and Ginsburgh, V. (1996), "The relevance of hedonic price indices, the case of paintings", *The Journal of Cultural Economics*, Vol. 20 No. 1, pp. 1-24.

Charters, S. (2006), "Aesthetic products and aesthetic consumption: a review", *Consumption, Markets and Culture*, Vol. 9 No. 3, pp. 235-255.

Coslor, E. and Spaenjers, C. (2016), "Organizational and epistemic change: the growth of the art investment field", *Accounting, Organizations and Society*, Vol. 55, pp. 48-62.

Czujack, C. (1997), "Picasso paintings at auction, 1963–1994", *Journal of Cultural Economics*, Vol. 21 No. 3, pp. 229-247.

Dupin, J. (1993), *Miró*, Ediciones Polígrafa & Abrams, Barcelona and New York, NY.

Edwards, S. (2004), "The economics of Latin American art: creativity patterns and rates of return", Working Paper No. 10302, National Bureau of Economic Research, 4, 2, Spring, Cambridge, MA, pp. 1-35.

Frey, B. and Pommerehne, W. (1989), *Muses and Markets: Explorations in the Economics of the Arts*, B. Blackwell, Cambridge.

Garay, U. (2017), "The returns to art investing: long-run evidence from a Latin American market", unpublished manuscript, presented at the annual conference of the Business Association for Latin American Studies, Santiago, April.

Garay, U. (2018), "The Latin American art market: literature and perspectives", *Academia Revista Latinoamericana de Administración*, Vol. 31 No. 1, pp. 239-276.

Garay, U., Vielma, G. and Villalobos, E. (2017), "Art as an investment alternative: the case of Argentina", *Academia Revista Latinoamericana de Administración*, Vol. 30 No. 3, pp. 362-382.

Goetzmann, W. (1993), "Accounting for taste: art and the financial markets over three centuries", *The American Economic Review*, Vol. 83 No. 5, pp. 1370-1376.

Goetzmann, W. (1996), "How costly is the fall from fashion?", in Ginsburgh, V.A. and Menger, P.-M. (Eds), *Economics of the Arts: Selected Essays. Contributions to Economic Analysis*, Vol. 237, Elsevier, Amsterdam; New York, NY; Oxford, pp. 71-84.

Goetzmann, W., Renneboog, L. and Spaenjers, C. (2011), "Art and money", *The American Economic Review*, Vol. 101 No. 3, pp. 222-226.

Halvorsen, R. and Palmquist, R. (1980), "The interpretation of dummy variables in semilogarithmic ecuations", *The American Economic Review*, Vol. 70 No. 3, pp. 474-475.

Higgs, H. and Worthington, A.C. (2005), "Financial returns and price determinants in the Australian art market, 1973-2003", *The Economic Record*, Vol. 81 No. 253, pp. 113-123.

Korteweg, A., Kräussl, R. and Verwijmeren, P. (2015), "Does it pay to invest in art? A selection-corrected returns perspective", *Review of Financial Studies*, Vol. 29 No. 4, pp. 1007-1038.

Kraeussl, R. and Logher, R. (2010), "Emerging art markets", *Emerging Markets Review*, Vol. 11 No. 4, pp. 301-318.

Kräussl, R., Lehnert, T. and Martelin, N. (2016), "Is there a bubble in the art market?", *Journal of Empirical Finance*, Vol. 35 No. C, pp. 99-109.

Lacher, K.T. and Mizerski, R. (1994), "An exploratory study of the response and relationships involved in the evaluation of, and in the intention to purchase new rock music", *Journal of Consumer Research*, Vol. 21 No. 2, pp. 366-380.

Mei, J. and Moses, M. (2002), "Art as an investment and the underperformance of masterpieces", *American Economic Review*, Vol. 92 No. 5, pp. 1656-1668.

Pesando, J.E. (1993), "Art as an investment: the modern market for prints", *American Economic Review*, Vol. 83 No. 5, pp. 1075-1089.

Pesando, J.E. and Shum, P. (1996), "Price anomalies at auction: evidence from the market for modern prints", in Ginsburgh, V. and Menger, P. (Eds), *Economics of the Arts, Selected Essays*, Elsevier, Amsterdam, pp. 113-134.

Pownall, R. and Graddy, K. (2016), "Pricing color intensity and lightness in contemporary art auctions", *Research in Economics*, Vol. 70 No. 3, pp. 412-420.

Reitlinger, G. (1961), *The Economics of Taste: The Rise and Fall of Picture Prices 1760-1960*, Barrie and Rockliff, London.

Renneboog, L. and Spaenjers, C. (2013), "Buying beauty: on prices and returns in the art market", *Management Science*, Vol. 59 No. 1, pp. 36-53.

Renneboog, L. and Spaenjers, C. (2014), "Investment returns and economic fundamentals in international art markets", in Velthuis, O. and Curioni, S.B. (Eds), *Cosmopolitan Canvases*, Oxford University Press, Oxford, pp. 129-146, available at: https://ssrn.com/abstract=2400473

Renneboog, L. and Van Houtte, T. (2002), "The monetary appreciation of paintings: from realism to Magritte", *Cambridge Journal of Economics*, Vol. 26 No. 3, pp. 331-358.

Rosen, S. (1974), "Hedonic prices and implicit markets: product differentiation in pure competition", *Journal of Political Economy*, Vol. 82 No. 1, pp. 34-55.

Shepard, S. (2010), *Measuring the Impact of Culture Using Hedonic Analysis*, October, Center for Creative Community Development, Williamstown, MA.

Stepanova, E. (2015), "The impact of color palettes on the prices of paintings", working paper, Sant' Anna School of Advanced Studies, Pisa, pp. 1-17.

Taylor, D. and Coleman, L. (2011), "Price determinants of aboriginal art, and its role as an alternative asset class", *Journal of Banking and Finance*, Vol. 35 No. 6, pp. 1519-1529.

Vosilov, R. (2015), "Sculpture as an alternative investment: an analysis of price dynamics between sculpture and equity and bond markets", *The Journal of Alternative Investments*, Vol. 17 No. 4, pp. 21-45.

Corresponding author
Urbi Garay can be contacted at: urbi.garay@iesa.edu.ve