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Art Collections and Taste in the Spanish *Siglo de Oro*

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Abstract

We analyze art pricing in a unique dataset on Madrid inventories between 1600 and 1750. Hedonic regressions reveal a number of interesting facts about the taste of Baroque Spanish collectors and the imports of foreign paintings. The hedonic price index shows an impressive increase in the price of paintings (relative to the cost of living) during the XVII century, in line with the Lopez hypothesis for which investment in art increases in wealthy societies without new productive investment opportunities. We examine price differentials between domestic and imported paintings: at the beginning of the century local works were priced substantially below imported paintings, but the price gap is gradually reduced during the century, with an increasing contribution of the younger painters. This is in line with a Schumpeterian hypothesis for which increasing demand induced increasing domestic quality, as priced by the market, and created the conditions for what is known as the *Siglo de Oro* of Spanish art.

"*I judge that Spain is a pious mother to foreigners and a very cruel stepmother to her own native sons*," Jusepe Ribera, lo Spagnoletto (1625)

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Little is known about the evolution of art price indexes in pre-modern periods and about their relation with both the art market and the artistic innovations. Only recently, interdisciplinary research in cultural economics, economic history and art history has analyzed markets for paintings of the Baroque age, both primary markets (for instance see Spear and Sohm, 2010; Etro and Pagani, 2012, 2013; Etro *et al.*, 2015) and secondary markets (Montias, 1982, 2002; De Marchi and Van Miegroet, 2006). Investigations from historical archives have been focused on inventories in Amsterdam (Loughman and Montias, 2001; Etro and Stepanova, 2013), Antwerp (Martens and Peeters, 2006), Venice (Cecchini, 2006) and Florence (Pinchera, 2014). Nevertheless, most of the datasets underlying these works are too limited in detail[1] to allow one to build a precise price index as it is possible for the following centuries on the basis of auctions' data.[2] A notable exception emerges from the inventories recorded in Madrid between 1600 and 1750, which allows us to shed new light on the pricing of paintings in a pre-modern art market and find evidence of a Schumpeterian process of increasing quality of the domestic producers.[3]

We build a dataset based on archival records of the inventories collected in Madrid during the Baroque age and largely put together at the Getty Research Institute (part of them were published and discussed in Burke and Cherry, 1997). Through this dataset we investigate the evolution of art prices for domestic and foreign painters in a period that is regarded as the Golden Age of Spanish art (the *Siglo de Oro*). Our aim is to show two important trends for the art market and the same evolution of art history in this period: the first is the rapid and impressive increase in the relative price of paintings, that can be associated with the rapid increase in the Spanish demand for art, and the second is the gradual convergence of the price of domestic paintings toward the price of imported paintings, which we interpret in terms of a Schumpeterian process of increasing domestic quality, as priced by the market.[4]

Our econometric analysis develops hedonic regressions on the price of paintings adjusted for the cost of living (based on the price of wheat) in Madrid. We first present a baseline regression on the full dataset with a complet set of control variables to build the price index and show its impressive increasing pattern during the XVII century and its decline during the first half of the XVIII century. Then we control for both artists fixed effects and collectors fixed effects following the methodology applied in Etro *et al.* (2015) to obtain more precise estimates of the determinants of prices and of the price differentials between painters. Moreover, we analyze price differentials between Spanish paintings and imported ones: local paintings were priced substantially below foreign ones at the beginning of the century, but the price gap is eliminated during the Golden Age suggesting that convergence had taken place, probably because high demand for art fostered local supply. To verify whether this was the case we focus on the subset of Spanish paintings and show that the price of the representative painting produced by a domestic artist increased

[1] In particular, the size of paintings is rarely documented in both Italian and Dutch inventories.

[2] For a suvey on the econometric research on modern art auctions see Ashenfelter and Graddy (2003). On auctions in Paris during the XVIII and XIX century see Etro and Stepanova (2015).

[3] For an early discussion of the market for paintings in Spain in this period see Falomir (2006). A classic introduction to Spanish art history is in Brown (1998).

[4] The same Schumpeter provided an early insight on the socio-economic influences on art history when he pointed out that, "just as describing the effects of the Counter Reformation upon Italian and Spanish painting always remains history of art, so describing the economic process remains economic history even where the true causation is largely non-economic" (1934, p. 59).

over time and relative to imported paintings, but also with the year of birth of the painter, which confirms that the quality of new domestic painters as priced by the market was indeed increasing during the *Siglo de oro*. In short, the price of a representative painting evaluated in Madrid increased rapidly during the Baroque age, probably due to an increase in the demand for art, at an even higher rate when produced by domestic painters, and even more for the new innovative artists entering in the market.

The work is organized as follows. Section 1 describes the evolution of the art market in Spain between the XVI and the XVIII century. Section 2 describes the dataset and some basic features of the Baroque art collections in Madrid. Section 3 implements the empirical analysis. Section 4 concludes.

1 The Art Market in Baroque Spain

Anecdotal evidence in Spanish art history suggests that during the XVI century the demand of paintings was initially promoted by the interest of the Kings, first Charles I and then Philip II, both admirers and collectors of Titian and other Venetian artists.[5] During the second half of the XVI century, when Spain became for a short period the most powerful and rich nation on earth (indeed, "the empire on which the sun never sets"), the popularity of paintings started to increase across the noble class, always eager to imitate royal habits. But most of the interest was for foreign painters, especially from Italy and Flanders (parts of which were actually Spanish territories), and painters active in Spain were still poorly considered and remunerated in the domestic market. This situation emerges also from what we know of the primary market for *retablos* (altarpieces) during the XVI century: commissions were often assigned in public auctions to the lowest bidding painter (Brown, 1998), which kept prices low and certainly did not foster artistic innovation.[6] Meanwhile, a mass production of low quality paintings was serving local demand and even colonial demand.[7]

The reign of Philip III (1598-1621) started a period of gradual decadence for Spain from both an economic and political point of view, which was much deeper than in the rest of southern Europe (Hobsbawm, 1954). In spite of this, many new important collections kept being created by many aristocratic figures, starting with the administrator of the monarchy, the *Duke of Lerma*. It was only with the reign of Philip IV (1621-1665), however, that the demand for art in Spain increased rapidly at all levels. The king was

[5] As noticed by Brown (1998), "at Philip's death, there were about 1,150 paintings at the Escorial, about 300 at the Alcàzar of Madrid, and perhaps 100 at the Pardo, totaling roughly 1,500 in all. If it is assumed that about 200 came from the collections of Charles V and Mary of Hungary, then it can be conservatively estimated that Philip collected over 1,000 pictures. This scale of acquisition is unprecedented in the history of collecting and represents the start of a new era - the one of the megacollector."

[6] An alternative procedure used in the XVI century was the *tasacion*: the price was established *ex post* by a team of appraisers nominated by the artist and the patron or, in case of irreconcilable difference, by an arbitrator. As noticed by Brown (1998), also this process "worked against the artist because it required him to invest his time, skill, and money in advance of payment, leaving him nothing to hold over the patron in the event of a grievance". El Greco experienced this "hold up" problem in more than one occasion: evaluations for his important commission for the cathedral of Toledo (in 1579) ranged between 228 and 900 ducats, but at the end the painter had to accept only 317 ducats. For a smaller version of the same painting by El Greco (in the inventory of Gaspar de Haro) see Plate 1.

[7] Hundreds of paintings were shipped every year from Seville to reach the American colonies for high prices (Falomir, 2006), especially in Perù (where a new independent art market will be soon created in Cuzco). See Hinojosa Galvez (2012).

a patron of Rubens and other contemporary artists, and his collection became the largest in the world (possibly of all times) with avid acquisitions which will become the core of the future Prado Museum. As noticed by Cherry (1997), "at the time of Philip's death there were about 2,600 pictures in only four of the many royal residences, out of a total that may have been as high as 5,500, not to mention hundreds more assembled by royal initiative at the Escorial!... Furthermore, Philip was an amateur painter who, in spite of the social prejudices of his age, established relationships with Rubens and Velazquez that went far beyond the usual dealings of artists and royal patrons."[8] Such a royal interest for painting spread around all the high society, leading to the development of new private collections rich of foreign works (or their copies) and domestic ones, traded at fairs and ports through art dealers (*tratantes en pinturas*) and at auctions (*almonedas*).[9]

Plate 1. El Greco, "The Disrobing of Christ" (ca. 1579; Upton House, Banbury, U.K.).

[8] We have detailed descriptions of most of the royal collections, but unfortunately they rarely include price evaluations.

[9] However, the best foreign works were imported thorugh acquisitions by nobles and clergymen, purchases by ambassadors and viceroys and through diplomatic gifts (Falomir, 2006).

As we will verify, this increase in demand for art induced an increase in the price of paintings, which is probably what attracted foreign artists (as the Tuscan painters Angelo Nardi and the Carducho brothers or, at the end of the century, Luca Giordano)[10] but exerted also an impact on local painters: indeed, it was only in this period that Spanish art finally flourished with an increasing supply of innovative talents. The same number of local painters increased in the major artistic centers compared to the previous century: in 1599 Seville reached 27 registered masters but the number increased much more in the middle of the century, Valencia went from 23 in 1522 to 55 in 1607 (Falomir, 2006) and Madrid reached 72 masters in 1625 and probably many more in the second half of the century (Cherry, 1997).[11] Self-consciousness of painters also increased, with the first Academy of St. Luke founded in Madrid to defend the interest of painting as a liberal art.[12] All this led to the development of important artistic achievements and the emergence of talents such as Velazquez, Ribera, Zurbaran, Herrera, Murillo, Coello and others associated with what today we call the *Siglo de oro* of Spanish art.

The crisis of the Spanish economy continued during the second part of the XVII century, characterized by continuous and unsuccessful wars against France as well as against bankruptcy (Brown, 1998, p. 233). Nevertheless, artistic commissions kept flourishing, not only in Madrid, but even in towns such as Seville and Valencia that lost most of their major role in international trade: most of them came from ecclesiastical institutions (financed with private donations) and aristocratic families (investing in art also for the lack of other investment opportunities). The core of the Golden Age was reached in the middle of the century, but also the last part of it, under the reign of Charles II (1665-1700) was extremely vital and Madrid remained a booming market for painting.[13]

The thesis that we test in this work is that *increasing demand for art induced an increase in art prices which stimulated artistic innovations by domestic painters*: this generated convergence between prices of Italian and Spanish paintings. This is not the first or the only historical market for art in which high demand and increasing prices appear to have attracted entry of painters and artistic innovations. The first formulation of this hypothesis we are aware of is due to the economic historian Lopez (1953). According

[10] Burke (1997) emphasizes that, in bringing Italian artists to decorate the Escorial (the so-called *escurialenses*), "Philip may be said to have secured an Italian foundation for the development of the seventeenth-century Spanish school of history and religious painting, just as his having brought Antonis Mor to the Iberian Peninsula added Netherlandish influence to Spanish portraiture" (p. 112).

[11] The entrepreneurial role of painters changed as well: lower level painters started selling on the streets to reach a wider audience, while higher level painters joined in "companies" to optimize the supply of large quantities of paintings executed by the assistants and started to be engaged in trade of paintings by others.

[12] As the other traditional guilds, however, also this was mainly aimed at protecting the economic interest of the history painters, that is to keep high prices for the commissioned altarpieces and to avoid the 10% tax on sales (*alcabala*).

[13] Brown (1998, p. 236-8) notices that, "[w]hile it is true that there was no figure of the magnitude of Velazquez, the number of excellent painters, it can be argued, exceeded those who practiced during the reign of Philip IV. The causes of this creative upsurge in an epoch of drastic decline are far from clear, but a few hypothesis can be formulated. Some credit should be attributed to Philip IV, whose lifelong affection for painting did much to encourage artists and patrons alike." Also Charles II promoted art and expanded the number of court painters. And the patronage of the church was paramount. "The quantity of altarpieces produced in and around Madrid leaves no doubt that in one way or another, the church escaped relatively unscathed from the economic disasters of the reign... But how rural towns like Burguillos and Orgaz found the wherewithal to engage the services of Francesco Rizi, or Calzada de Oropesa those of Claudio Coello, is still to be discovered. Whatever the causes, the effect was a booming market for the painters of Madrid."

to the so-called Lopez hypothesis, the demand for art flourishes in wealthy societies with a low marginal productivity of capital or at the beginning of an economic crisis: without high returns from investment in productive activities, as during Renaissance in Italy or the Baroque age in Spain, investment in art by the noble class expands. We complement this hypothesis with its immediate consequence: increasing demand pushes prices upward which attracts artistic innovations.[14] Given the economic decline of Spain during the Baroque age, our evidence provides some indirect support for the Lopez hypothesis.

Montias (1982, 2002) has conjectured a Schumpeterian hypothesis for the Dutch market for paintings during its Golden Age (the XVII century) characterized by increasing demand for art and both cost-saving and artistic innovations. Etro and Stepanova (2013) have provided some evidence in this direction based on the Amsterdam market: in that case the local school was already established in the market, increasing demand was coming from the middle class, and changes in the price of paintings were affecting the entry of new painters and innovations.[15] The peculiarity of the current analysis is that the Spanish market, largely dominated by the aristocratic class, was characterized by a sort of duality between foreign and local supply, which allows us to study the convergence of the respective prices during a century of increasing demand for art.

2 The Dataset on Madrid inventories

Our data on inventories cover the period between 1600 and 1750,[16] with a total of 166 inventories and 13 thousand paintings evaluated (for more information on individual collectors see Table 6). As usual at the time, the motivation for these inventories ranges from the death of the owner, to marriages, business contracts, sequestrations, changes of residences and estate sales. An average collection in Madrid contains seventy five paintings if we exclude the three collectors with over a thousand paintings, namely *Gaspar de Haro, Marques de Eliche*,[17] *Juan Gaspar Enriquez de Cabrera*[18] and *Diego Messia, Marques de Leganes*.[19] As these, most of the other collectors belong to the aristocratic class, as in the notable cases of *Manuel*

[14] For an interesting discussion of art demand during Renaissance see O' Malley (2013).

[15] In Etro and Stepanova (2015) we have analyzed the French market in the subsequent century (the XVIII century): also in that case the local school was already established, but increasing demand was coming from the high class, and increasing prices appear to have induced artistic innovations.

[16] Most of the data derives from the Getty Research Institute, but we added paintings from the Laganes collection as reported by Perez (2010).

[17] *Gaspar de Haro (*1629-1687) inherited an already large collection from the father, *Luis*. He was sent to Rome as ambassador and to Naples as Viceroy. At his death, he owned over 3,000 pictures, approximately 1,200 of which were kept in his houses in Madrid (Brown, 1998) and the rest in Italy.

[18] Also *Juan Gaspar de Cabrera* (1625-1691) inherited a large collection from the father *Juan Alfonso*, Viceroy of Sicily and then Naples, and spent his life in Spain preserving and enhancing his collection. The inventory from his building classifies rooms entirely dedicated to painters such as Raphael, Tintoretto, Titian, Bassano, Ribera, Orrente, Rubens and a room for the "Spaniards".

[19] The *Marqués de Leganés* (1580-1655) was an army commander active in the Spanish Netherlands and North Italy. See Volk (1980) on his collection mainly focused on Flemish artists and Perez (2010) for its detailed description.

de Fonseca y Zuniga,[20] *Conde de Monterrey* and *Ramiro Felipez de Nunez de Guzman.*[21]

The fraction of paintings that belong to nobles is high and stable over time (contrary to what happened in the Dutch inventories, where the importance of the middle class was rapidly increasing). However, we have also records of collections held by royal secretaries and administrators, such as *Jeronimo de Cuellar*, *Bartolomè de Legasa*, *Diego de la Torre*, *Nicolas Gonzales de Villa*, and *Francisco de Oviedo*, legal experts such as *Sebastian de Cotes y la Carcel* and some middle class collectors. These included merchants as the jeweler *Joseph de Lezana*, the silk merchant *Francisco Diaz de la Hoz* or the silversmith *Luis de Zabalaza*, accountants (*Jeronimo de Alviz*, *Domingo Soria Arteaga* or *Luis Fernandez de Vega*), clergymen (*Juan de Espina* or *Juan de Fonseca y Figueroa*), doctors (*Juan de Matute* or *Gaspar Carculli*) and painters (*Vicencio Carducho*). Descriptive statistics for our inventories are presented in Table 1, distinguishing between the full dataset and the subset of attributed paintings.

Notarized appraisals (*tasaciones*) were mainly done by painters,[22] and occasionally by amateurs (notaries, priests and royal functionaries) following a rigid procedure (and within thirty days from death in case of death inventories) for a small fee. Evaluations were reliable because they were aimed at establishing a fair price for a subsequent public sale, in which sellers and buyers could make recourse for prices below or above 50% of the appraised value (Cherry, 1997).

The majority of prices are recorded in the unit of account of the time, the *real de plata* (whose corresponding coin, the silver *real de vellon*, was consistently devaluated at the end of the XVII century), but some prices are recorded in *ducados* (equivalent to 11 reales), *doblones* (equivalent to 60 reales) or *maravedies* (1 real corresponds to 34 maravedies), so we translated all prices in reales de plata. Moreover, to convert nominal prices in real values we normalized them with the annual price of wheat, which is our best available proxy for the cost of living. We obtained information on the annual price of wheat in Madrid from the dataset build by Robert Allen (Global Commodity Price Database): in this dataset prices of wheat are nominated in grams of silver per liter of wheat, and since we know that eight reales contained 24.47 grams of silver, we are able to convert prices in reales into prices "in liters of wheat" for the empirical analysis.

The average (nominal) price of paintings is 723 reales; the cheapest attributed painting is a face portrait by Bartholmè Carducho evaluated 6 reales in the 1638 inventory of the brother Vicencio, while the most expensive piece is a *Venus with Mercury and Cupid (The School of Love)* by Correggio, evaluated 420,000 reales in the 1689 inventory of *Gaspar de Haro* (currently at the National Gallery in London). The collection of *Gaspar de Haro* included also the most expensive Flemish paintings (two portraits, one

[20] The collection of the *Count of Monterrey* (1586-1653) was largely build in Italy between 1628 and 1637. There, he was also in charge of purchasing old masters' paintings for the King (as Titian's "Bacchanal of the Andrians" and the "Worship of Venus") and commissioning new ones (for instance from Lanfranco, Domenichino and Stanzione). Similarly, *Luis de Haro* had been in charge of acquisitions from the English Royal collection and the King's brother, the cardinal infante *Ferdinand* had been in charge of acquisitions from Flanders (see Brown, 1998).

[21] *Ramiro Felipez de Nunez de Guzman* (1600-1668) was well known as a patron of Ribera in Naples. His small collecton contained Raphael's "Madonna of the Fish" (now at the Prado), virtually stolen from San Domenico in Naples.

[22] For instance, we know that the inventories of *Leonor Maria de Guzman* and *Manuel de Fonseca y Zuniga* were appraised by Antonio de Pereda, those of *Juan de Castaneda* and *Joseph Salvador Sarmiento* by Palomino, those of *Antonio de Mardones* and *Miguel de Salamanca* by Juan de Miranda, the inventory of the doctor *Alonso Cortes* was evaluated by Vicencio Carducho, and the one of *Juan Gaspar de Cabrera* by Claudio Coello.

Table 1: Descriptive statistics

	Full sample (12 993 observations)			Sample of attributed observations (2 328 observations)		
Variable	Mean	Std. Dev.	Av.price (reales)	Mean	Std. Dev.	Av.price (reales)
Price (reales)	723	5079		2003	11122	
Copy	0.032	0.176	546	0.174	0.379	547
Anonymous painting	0.799	0.401	436	–		
Dutch school	0.001	0.032	681	0.005	0.072	726
Flemish school	0.046	0.21	1 813	0.212	0.409	2 069
Italian school	0.089	0.285	2 893	0.476	0.5	2 983
Spanish school	0.058	0.234	582	0.308	0.462	578
Uncertain attribution	0.007	0.085	824	–		
Unknown genre	0.096	0.295	568	0.029	0.167	450
Figurative	0.568	0.495	881	0.56	0.496	2 787
Genre	0.031	0.173	827	0.066	0.248	1 167
Landscape	0.09	0.287	351	0.093	0.291	628
Portrait	0.141	0.348	592	0.157	0.364	1 543
Still life	0.074	0.262	371	0.095	0.294	549
Size unknown	0.852	0.355	594	0.574	0.495	1 784
Size < 0.5 square meters	0.029	0.167	663	0.095	0.293	888
Size $0.5 - 1$ square meters	0.037	0.188	949	0.104	0.305	1 481
Size $1 - 1.5$ square meters	0.026	0.158	1 083	0.072	0.258	1 750
Size $1.5 - 2$ square meters	0.014	0.119	1 241	0.04	0.197	1 949
Size $2 - 3$ square meters	0.02	0.141	1 707	0.052	0.221	2 932
Size $3 - 4$ square meters	0.008	0.09	2 391	0.022	0.146	4 088
Size > 4 square meters	0.014	0.116	4 611	0.042	0.201	7 057
Unknown support	0.666	0.472	585	0.717	0.451	1 602
Canvas	0.162	0.369	1 108	0.173	0.378	2 480
Wood panel	0.079	0.271	1 431	0.071	0.257	5 241
Lamina	0.092	0.289	445	0.039	0.194	1 431
Golden frame	0.213	0.41	732	0.268	0.443	1 832
Black frame	0.198	0.398	495	0.21	0.407	1 415
Noble collector	0.534	0.499	1 076	0.552	0.497	3 160
Current place known	0.005	0.069	17 075	0.022	0.146	20 384

by Rubens and one by van Dyck evaluated 55,000 reales each) and the most expensive Spanish paintings, a *Nativity* by Ribera evaluated 33,000 reales and the *Rockeby Venus* by Velazquez, evaluated 16,500 reales (today at the National Gallery; see Plate 2). We can get a sense of the relative price of these paintings by noting that unskilled workers in the 1620s received one real as a minimum day's wage and in royal sites they could reach up to five reales (Burke and Cherry, 1997).

The majority of paintings lacks a precise attribution, but 18% of the observations report the author, which is a precious source of information on the taste of Spanish collectors. In most cases the authorship is mentioned as sure, though we may doubt some of the attributions to foreign old masters (most of the attributions to Leonardo and Michelangelo and some of the many attributions to Titian and Rubens were certainly too generous). For 17% of the attributed observations there is an explicit mention that the works are copies. The cited artists belong mainly to the Italian school (43%), the Spanish one (29%) and the Flemish and Dutch schools (24%), while the remaining 4% of the observations are attributed to unknown artists.[23] Italian authors conserve the relative majority of the attributed works in Spanish inventories and these percentages are rather stable over the century: the most common authors are the Bassanos, Titian, Tintoretto, Giordano, Raphael, Codazzi, Cambiaso, Veronese and Reni. Between Flemish painters Rubens and van Dyck are the most frequent authors followed by Brueghel (a label probably associated with multiple members of the family of painters) and Juan de la Corte, who, however, was mainly active in Spain. The most frequent Spanish painters are, in order, Pedro Orrente, Juan van der Hamen y Leon, Diego Velazquez, Eugenio Caxes, Alonso Sanchez Coello and El Greco.

Paintings attributed to the Italian school have the highest average price of almost 3,000 reales, followed by the Flemish and Dutch school, and by the Spanish school with an average price of only 578 reales. This may reflect a preference for foreign art, a selection bias (if only high quality attributed paintings were imported in Madrid), or simply a lower average quality of the Spanish paintings in this period. However, as we will see, these absolute price differentials hide a very different evolution of prices during the century.

The height and length of paintings is precisely indicated for an exceptional part of the observations compared to other contemporaneous inventories as the Italian ones (Cecchini, 2006, Pinchera, 2014) or the Dutch ones (Montias, 1982), which actually do not report exact sizes. We know the exact size for 14% of all the paintings and 43% of the attributed ones. The measure is in *vara* or *palmo* which we convert into meters (1 *vara* is 83.6 cm and 1 *palmo* is 21 cm). In Fig. 1, we report the distribution of paintings by categories of size, emphasizing its mode of 0.88 square meters. The average size of the paintings is instead of 2.32 square meters and is rather stable over time.[24]

In Fig. 2 we provide a more detailed description of the distribution of paintings by size. The horizontal axis reports the width of paintings and the vertical one their height: the size of each circle corresponds to the frequency of paintings with such a dimension, while a darker colour reflects a higher average price. The solid line is the *iso-size locus* corresponding to the modal size, while the dotted line is the *iso-size*

[23] Three foreign painters (El Greco, Nardi and Carducho) are classified in the Spanish school because they spent most of their careers in Spain. We had also three paintings attributed to English painters and twenty four attributed to French painters, which we excluded from the analysis due to considerable under-representation (but Dughet is included in the Italian school). The only German painters are Durer and Holbein.

[24] Contrary to this, Dutch inventories have shown a gradual reduction in average size during the XVII century (Etro and Stepanova, 2013), mainly aimed at satisfying the new demand of the middle class for cheaper paintings.

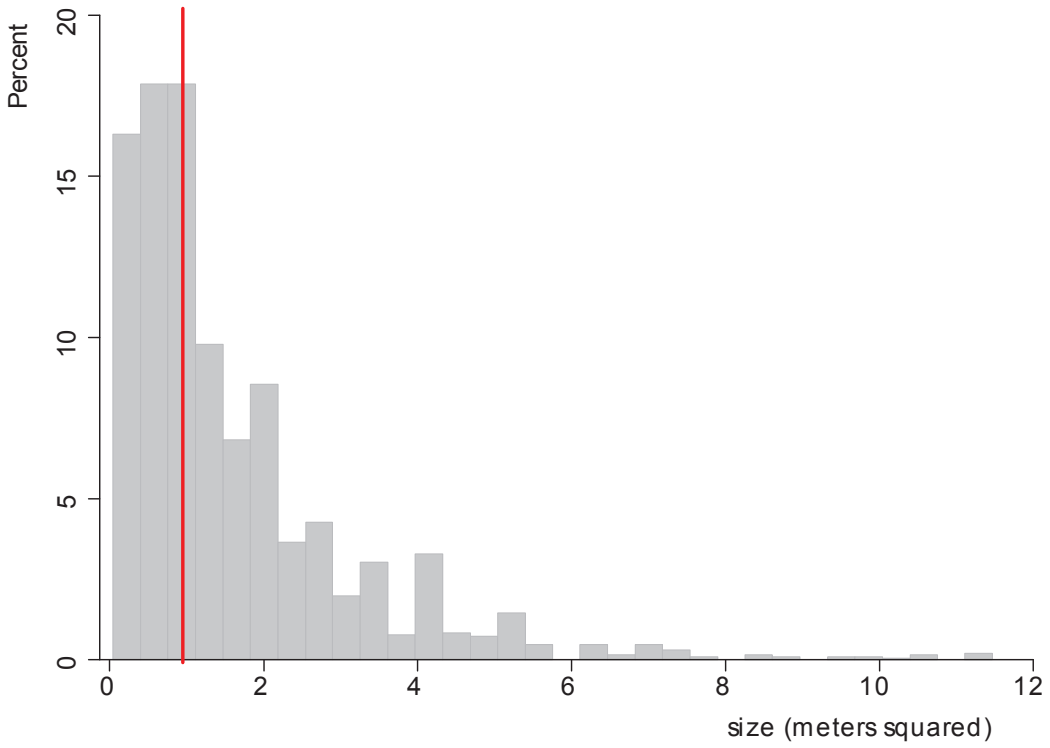

Figure 1: Histogram of sizes distribution. Note: Red line indicates the mode of the distribution

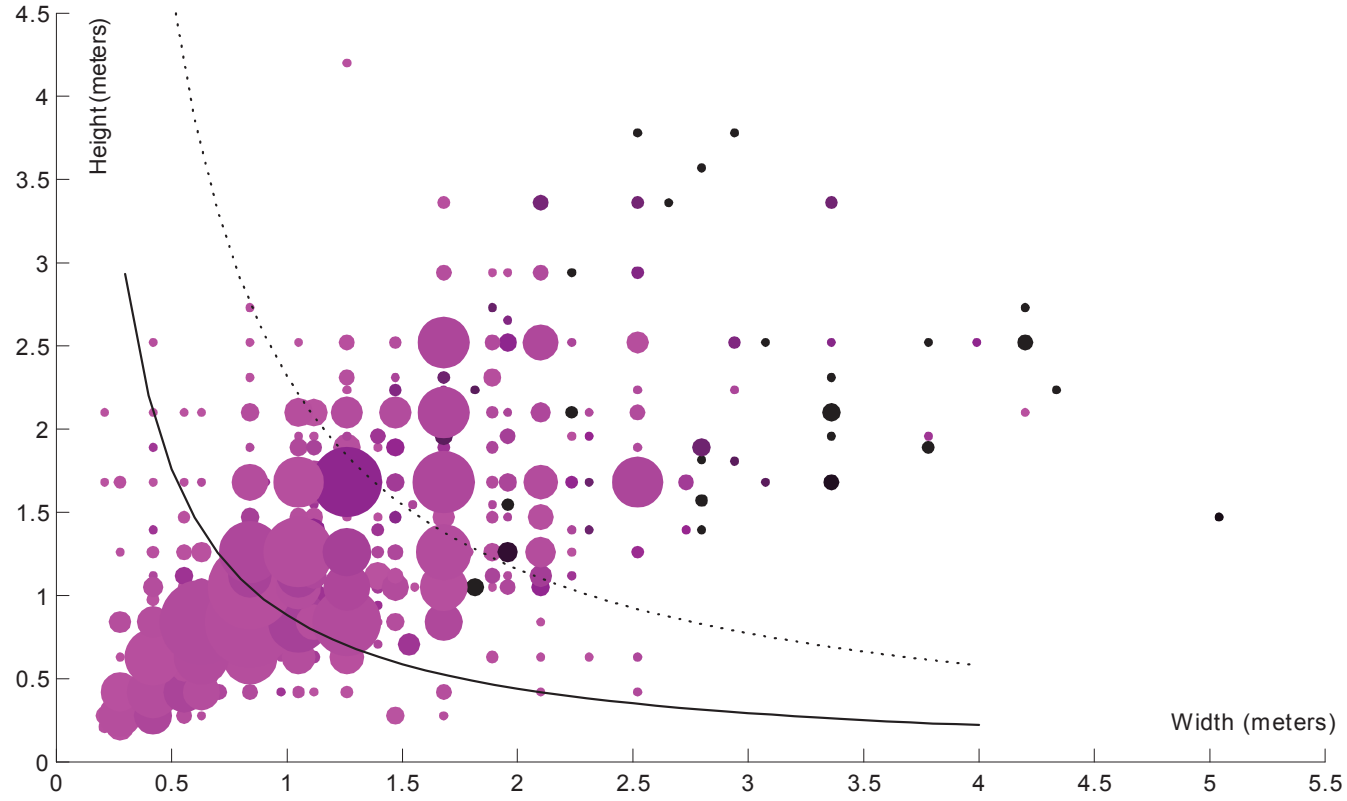

Figure 2: Height / Width distribution. Note: Size of the circle corresponds to the frequency of such height/ width combination; Circle color corresponds to the average price of such height/ width combination: darker is the color higher is the price; Dotted line indicates average size of 2.32 meters squared; Black line indicates the mode size of 0.88 meters squared

locus corresponding to the average size. Most paintings are distributed along two rays, corresponding to landscape-oriented paintings and portrait-oriented paintings, with prices increasing in size. Recently, Higgs and Forster (2014) have argued that departures from standard proportions, namely from the classic ideal of *golden ratio* between height and length, can affect prices, but they have tested such hypothesis on modern auctions and modern art, and not on historical periods in which the link with the classic ideal of the golden ratio could be stronger.

Plate 2. Velazquez, "Rockeby Venus" (ca. 1648; National Gallery of Art, London).

For 21% of the observations the inventory mentions a golden frame which could increase the value of the work (compared to the more common black frames). Common supports include canvases (*lienzo*), panels (*tabla*) and other smooth surfaces (*lamina*). For a small selected group of high quality paintings (2.2% of the attributed observations) the dataset reports the current location of the painting, which is a proxy for fame and quality of the painting. In 29% of the observations multiple paintings were evaluated together for reasons related to the subject (as for series of the twelve months): in such cases we built a variable indicating how many paintings were in such a group (with twelve as the upperbound to exclude spurious multiple evaluations). We also measured the length of the description of the paintings in the inventory (in letters) to obtain a rough proxy for the quality of the paintings as perceived by the appraisers.

We were able to classify most paintings (from the title and the description) into the five traditional categories: figurative paintings, genre paintings, landscapes, portraits and still-life paintings.[25] The residual category includes paintings of unspecified genre. The majority of paintings in the Baroque Spanish collections, and by far the most expensive, were the figurative paintings, including religious, mythological and historical subjects plus the battles (as in the classification used by Etro and Stepanova, 2013, for contemporary Dutch inventories and Etro *et al.*, 2015, for contemporary Italian paintings). Religious subjects were prevailing, accounting for half of the observations, while mythological subjects were relatively rare in the collections. The rarity of mithological subjects is also clear in the local production (Brown, 1998; Plate 2 being an exception) and was possibly due to the pressure of the *Inquisition* or, more simply, to the Italian leadership in the subject (as for the Flemish leadership in landscapes). Portraits and genre paintings had lower evaluations compared to the figurative paintings, while landscapes and still-lifes were the least valuable. Of course, price differentials were larger between attributed paintings compared to the full dataset, which includes a fringe of low quality products.

Contrary to the Dutch inventories (Loughman and Montias, 2001) we do not have much information on the placement of paintings in rooms, but it appears that portraits were mostly in the library room, devotional pictures in the bedrooms and hunting scenes in the dining room, and that tapestries often covered paintings during the winter (Cherry, 1997). Finally, we know when the collector was noble (namely a Duque, a Marques, or a Conde), which we expect to signal a higher willingness to pay for art and therefore richer collections.

3 Hedonic regressions and the price index

We now present the hedonic regressions for the price of paintings in Madrid. In Table 2 we first present a baseline regression on the full dataset with a complet set of control variables but without fixed effects for artists or collectors; however we partially control for the quality of the artists through dummies for the national schools of the painters and for the characteristics common to each collector (through the average price of the paintings present in the same collection and some dummies correlated with quality). Then we present a regression limited to the attributed paintings with a full set of artists fixed effects that provide a good control for quality characteristics. Finally, the last regression is limited to painters represented with different works in different collections and includes both artists fixed effects and collectors fixed effects following the methodology applied in Etro *et al.* (2015). The corresponding fixed effects for artists and collectors are reported in Tables 5 and 6, where we omitted the artist Ribera, as the only Spanish artist whose career was entirely spent in Italy, and the collector *Pedro Nunez de Guzman, Conde de Villaumbrosa, Marques de Montealegre*. To maximize the number of observations in all these regressions, we control for size only through dummies for different size categories and an omitted category with the large group of paintings whose size is unknown.

Prices appear to reflect the objective features of the paintings (size, originality, attribution) and of

[25] In our classification, landscapes include *hermitanos* (which depicted hermit saints in the composition) and portraits include typical depictions of dwarves (*enanos*), clowns (*bufones*), drunks (*borrachos*) and madmen (*locos*) that had a genre content.

Table 2: Price regressions

	Regression(1)		Regression(2)		Regression(3)	
Year	0.409***	(0.0302)	1.011***	(0.0738)		
Year squared	-0.000119***	(0.000009)	-0.000296***	(0.00002)		
Collectors fixed effects					(YES)	
Artists fixed effects			(YES)		(YES)	
Anonymous painting	omitted		–		–	
Copy	-0.518***	(0.0623)	-1.283***	(0.0679)	-0.976***	(0.0686)
Spanish school	0.531***	(0.0448)				
Dutch school	0.577***	(0.121)				
Uncertain attribution	0.637***	(0.116)				
Flemish school	1.058***	(0.055)				
Italian school	1.080***	(0.0407)				
Unknown genre	omitted		omitted		omitted	
Figurative	0.105***	(0.0349)	0.736***	(0.135)	0.572***	(0.144)
Genre	0.301***	(0.0655)	0.675***	(0.160)	0.170	(0.174)
Landscape	-0.313***	(0.0460)	0.401**	(0.161)	0.188	(0.168)
Portrait	-0.326***	(0.0415)	0.123	(0.150)	-0.126	(0.156)
Still life	-0.425***	(0.0486)	0.375*	(0.204)	0.166	(0.202)
Size unknown	omitted		omitted		omitted	
Size < 0.5 square meters	-0.403***	(0.0616)	-0.074	(0.0812)	-0.133*	(0.0806)
Size $0.5 - 1$ square meters	-0.147***	(0.0547)	0.052	(0.0798)	0.043	(0.0789)
Size $1 - 1.5$ square meters	0.136**	(0.0638)	0.168*	(0.0917)	0.295***	(0.0891)
Size $1.5 - 2$ square meters	0.207**	(0.0839)	0.406***	(0.114)	0.578***	(0.114)
Size $2 - 3$ square meters	0.406***	(0.0713)	0.539***	(0.104)	0.690***	(0.0984)
Size $3 - 4$ square meters	0.675***	(0.110)	0.855***	(0.154)	0.875***	(0.151)
Size > 4 square meters	1.239***	(0.0871)	1.393***	(0.117)	1.391***	(0.111)
Unknown support	omitted		omitted		omitted	
Canvas	0.231***	(0.0287)	0.210***	(0.0643)	0.406***	(0.0723)
Wood panel	0.210***	(0.0379)	0.013	(0.0919)	0.147*	(0.0836)
Lamina	0.047	(0.0360)	-0.032	(0.134)	0.359***	(0.124)
Nr. paintings evaluated	-0.118***	(0.0057)	-0.0609***	(0.0131)	-0.0593***	(0.0144)
Golden frame	0.143***	(0.0253)	-0.120**	(0.0544)	0.155***	(0.0547)
Black frame	-0.054**	(0.0260)	-0.189***	(0.0586)	0.0652	(0.0617)
Noble collector	0.222***	(0.0226)	0.423***	(0.0621)		
Av. price rest of collection	0.00008***	(0.000002)				
Description length	0.003***	(0.00012)				
Current place known	0.937***	(0.145)				
Constant	-344.7***	(25.38)	-856.5***	(62.00)	6.980***	(0.264)
Observations	12 993		2 328		1 927	
Adjusted R^2	0.47		0.64		0.76	

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

the inventory. The baseline regression shows a ranking of prices across genres, with figuratives and genre paintings better paid than landscapes, portraits and, at the bottom, still lifes; however, these price differentials tend to disappear in the full specification, with the only exception of the figurative paintings which remain overpriced relative to the other genres (Etro *et al.*, 2015). Golden frames increase the price compared to black ones. Mixed results emerge concerning the support of the painting, with canvases better paid than wood panels and other smooth supports. Usual control variables, such as the length of the description of the painting in the inventory (measured in letters), the average price of the rest of the collection and the fame of the painting (proxied by the fact that we know its current location) have the expected positive impact on prices. Noble collectors have paintings whose evaluations are substantially higher than the other collectors.

Plate 3. Velazquez, "Fable of Arachne" (ca. 1656; Prado Museum, Madrid).

The relation between size of paintings and price is particularly interesting and deserves further attention. In Table 3 we repeat our baseline regressions only for the paintings whose exact size is known and controlling for size with a linear and a quadratic term. The usual control variables confirm the results mentioned above, but we also emphasize the precise concave relation between size and prices. Moreover,

the baseline regressions without artist fixed effects in Table 3 suggest that the evaluations of the paintings decline with unusual proportions, in particular when the ratio between long and short size increases and when the size departs from its mode. Higgs and Forster (2014) have recently argued that unusual proportions can be negatively correlated with prices, suggesting that this may reflect departures from the *golden ratio*, a classic ideal in western art.[26] However, once we control for the quality of paintings with the artist fixed effects (Table 3, column (4)), the explanatory power of the mentioned ratio and of the distance from the modal size disappear.

Table 3: Price regressions for paintings with known size

	(1)	(2)	(3)	(4)
Year	1.107***	1.108***	1.104***	1.494***
	(0.0666)	(0.0665)	(0.0663)	(0.105)
Year squared	-0.000325***	-0.000326***	-0.000325***	-0.000438***
	(0.0000197)	(0.0000197)	(0.0000196)	(0.0000312)
Size	0.442***	0.442***	0.606***	0.418***
	(0.0268)	(0.0268)	(0.0483)	(0.0607)
Size squared	-0.0192***	-0.0192***	-0.0133***	-0.0104***
	(0.00269)	(0.00269)	(0.00304)	(0.00315)
Ratio long/short side		-0.121***	-0.118***	-0.0320
		(0.0401)	(0.0399)	(0.0525)
Deviation from modal size			-0.245***	-0.0720
			(0.0600)	(0.0740)
Control variables	(YES)	(YES)	(YES)	(YES)
Artist FEs	(NO)	(NO)	(NO)	(YES)
Observations	2 113	2 113	2 113	1 184
Adjusted R^2	0.57	0.57	0.57	0.70

Standard errors in parentheses; *** ($p < 0.01$)

Set of control variables includes variables used in the baseline regression (Table 1 Regression(1)).

All the regressions of Tables 2 and 3 controlling in different ways for size and other quantifiable features of the paintings emphasize an inverse-U relation between the relative price of paintings and time, with a rapid increase during the Golden Age and a decline only in the first half of the following century. The peak of the parable ranges between 1698 and 1718 in the different specifications of Tables 2 and 3. In Fig. 3 we

[26] The golden ratio between a long side L and a short side S, is such that $L/S = (L+S)/L$, which corresponds about to $L/S = 1,618$. Nevertheless, we are not aware of any solid art historical association between this ratio and the size of paintings. Also the distance of the ratio between long and short side from the golden ratio is not significant in our regressions.

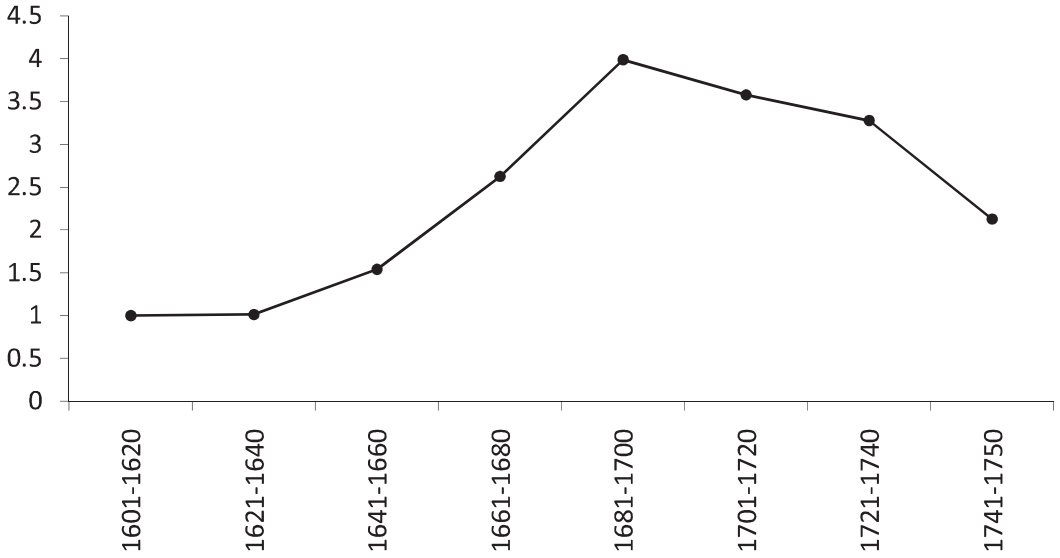

Figure 3: Price indexes for the Spanish art market (1600–1750)

present the hedonic price index built on the basis of the baseline regression with time dummies in place of the quadratic trend, but with all the other control variables except for the average price of the paintings (which would spuriously affect the index). The pattern is confirmed, with a dramatic increase in the real price of paintings over the XVII century and a subsequent slower reduction during the XVIII century. The price of a representative painting doubled between the beginning and the middle of the century and doubled again in the second half of the century, reflecting the wide expansion of the demand for art mentioned in the introduction. Since Spain reached high levels of wealth at the end of the XVI century and went through a slow decline during the following century, this appears to support the Lopez (1953) hypothesis, for which the demand for art flourishes in wealthy societies with a low marginal productivity of capital or about to enter in economic crisis.

Looking at Tables 5 and 6 we can infer the extra price for a representative painting by a given artist after controlling for differences across collectors. Indeed, some collectors, mostly nobles, were systematically engaged in obtaining high quality paintings by their favourite artists: this is especially the case for *Gaspar de Haro*, but also other large scale collectors (such as *Juan de Castaneda*, *Juan Gaspar Enriquezz de Cabrera, Antonio Mesia de Tovar*, *Manuel de Fonseca y Zuniga* and, to a lesser extent, the *Marqués de Leganés*) and some minor collectors who were purchasing a lower number of precious paintings, often non-aristocratic figures searching for social recognition (such as *Jeronimo de Cuellar, Francisco de Oviedo* or *Pedro de Arce*).[27] At the same time, other collectors could only put together works of lower price, as

[27] *Jeronimo de Cuellar* was a collector of works by Velazquez, while *Pedro de Arce*, a member of the royal honor guard, put together a collection with remarkable Spanish paintings, including *The Fable of Arachne* by Velazquez evaluated 5,500 reales in 1664 (see Plate 3). Cherry (1997) notices that art collecting was often a way to improve the social condition following the taste of the King Philip IV: "collecting might have been a means of catching Philip's eye. This is not to suggest that Arce, Cuellar, and other courtiers of middle rank collected merely to advance their careers, but it does indicate that

was the case for *Fernando de Borja y de Aragon*, *Pompeo Leoni*, *Jeronimo de Alviz*, *Cristobal Gonzales Cossio*, whose collections were nevertheless large. Since we are controlling for artists fixed effects and we are considering evaluations in the secondary market, significant differences between collectors must reflect differences in their willingness to pay for quality.[28]

Plate 4. Velazquez, "Las Meninas" (ca. 1656; Prado Museum, Madrid).

Controlling for these differences, the best prices for artists were associated with the Italian school, mainly with old Venetian masters such as Titian, Veronese, Tintoretto and the Bassanos (especially in case of original works by Jacopo Bassano), but also Correggio, Giulio Romano and Raphael or contemporary painters such as Caravaggio and Stanzione, who had been both active in Naples, at the time within Spanish territory. Only the contemporary Flemish school can occasionally reach prices comparable to those of the

seventeenth-century society, to use a biological metaphor, tended to select in favor of those who owned pictures" (p. 187).

[28] In particular, they cannot reflect incentive mechanisms toward the artists, as it would be the case for a primary market, where the price is the compensation of the painter (on that case see Etro *et al.*, 2015).

Italians, especially with van Dyck and Rubens, but also with some genre painters and still life painters like Snyders and Brueghel. The Dutch school follows, primarily with the portraits of Anthonis Mor.

The average prices for the painters active in Spain are much lower. There are no Spanish painters that are significantly better priced than Ribera, who was Spanish but spent all his career in Italy and was well aware of this fact: as he noticed in 1625, "Spain is a pious mother to foreigners and a very cruel stepmother to her own native sons." Between local artists the highest evaluations are reached by some of the best masters trained in Seville, as Bartolome Murillo (see Plate 5) and Alonso Cano,[29] and in Madrid, as Jusepe Leonardo and Claudio Coello (see Plate 6), but the frequency of their works is limited in the dataset and none of them is priced significantly better than Ribera.[30] More common in the collections are other established painters of the *Siglo de oro*, and the highest evaluations between them are for Vicencio Carducho, Angelo Nardi, Pedro Orrente and, behind them, the greatest Spanish master, Diego Velazquez.[31] Some local painters of the XVI century appear frequently in the inventories, and some of them, such as Juan Fernandez de Navarrete (El Mudo) and Luis de Morales (El Divino), record relatively good prices, while El Greco, and Alonso Sanchez Coello, probably the most talented painter of the mannerist period, report lower prices. Even worse evauations are usually reached by portraitists such as Juan Carreno, still life painters such as Antonio de Pereda, Juan de Arellano and Juan van der Hamen y Leon, landscape painters such as Francisco Collantes and genre painters such as the noble Pedro Nunez de Villavicencio. One of the great masters of the century, Francisco de Zurbaran, is associated with very low prices, probably reflecting the simple devotional pictures produced by his workshop for the national (and colonial) market in Seville, which was losing all its economic and artistic influence in the middle of the century;[32] the same can be said for Francisco Ribalta, leading artist in a decaying Valencia.[33]

The main message emerging from the regressions above is that domestic paintings were consistently

[29] Both of them were also active in Madrid, where we know that Murillo was paid the 2,600 reales for an altarpiece in 1661 (Brown, 1998, p. 206). Murillo's compensations were much higher in Seville, where in 1670 he was paid 13,300 and 15,975 reales for two large canvases for La Caridad. Nevertheless, Murillo supplied also international private collectors with smaller figurative and genre paintings, becoming the only painter active in Spain who achieved an international reputation during its own lifetime. As the artist abd biographer Palomino noticed, "today, outside of Spain, a picture by Murillo is esteemed more than one by Titian or van Dyck. That is how the flattery of color can coax the layman's favor" (Palomino, 1715–24).

[30] An important painter of the last part of the century, Juan de Valdés Leal, appears in the dataset with just one painting, a church interior evaluated 1,150 reales in 1683. However, we know that he reached high compensations in Seville, though systematically below those of the rival Murillo. For instance, two large canvases for La Caridad were paid 5,740 reales in 1670 (Brown, 1998).

[31] Carducho and Nardi were Italians and Orrente visited Italy and was a successful producer of paintings in the style of the Bassano's and Caravaggio. We know that his altarpiece for the cathedral of Toledo was paid 1,500 reales in 1617 (Brown, 1998, p. 94). As well known, also Velazquez visited Italy.

[32] The initial career of Zurbaran in Seville was problematic: in 1626 he accepted 4,000 reales for 21 paintings (while Herrera was paid 900 reales per picture in the following year), and in 1630 the guild officers brought him to court for not passing the examination required to practice in town. The challenge was dismissed by the council and good commissions did follow (with 2,200 reales paid in 1634 for the twelve labors of Hercules). However, the Sevillan market started to decline in the following years and after the plague of 1649. Brown (1998, p. 201) notices that for the home market "Zurbaran and his workshop resorted to making devotional pictures for individual clients. Small in scale and simple in composition, these paintings were markedly different from the complex, doctrinal works created for the monasteries of Andalusia." Nevertheless, the artistic contribution of Seville remained important until the end of the century, also thanks to the success of the drawing academy, founded in 1660 by Herrera and Murillo.

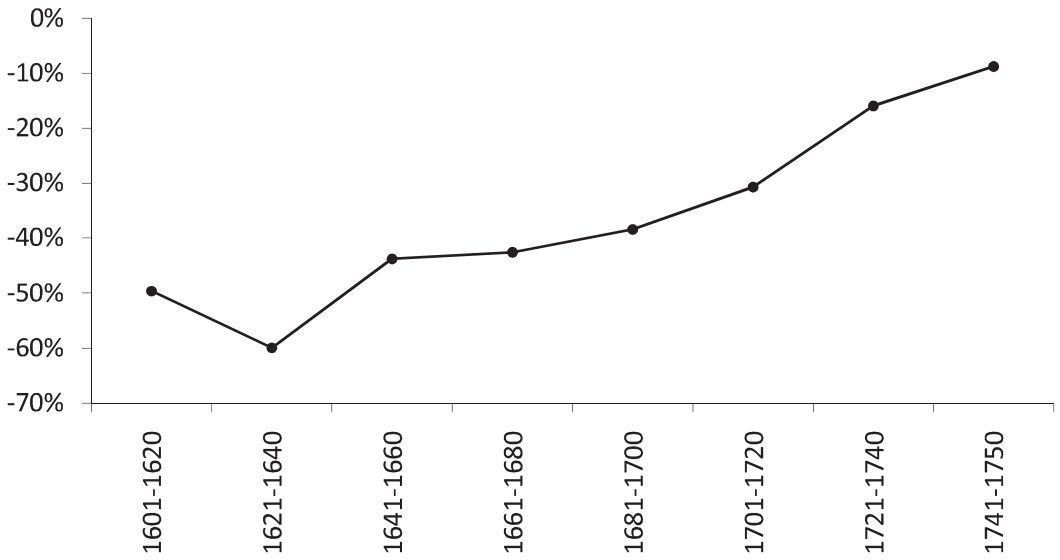

Figure 4: Price differential between Spanish and Italian school (rolling regression)

evaluated less than imported paintings, possibly reflecting both a lower quality of the Spanish school and a selection effect. The selection effect could be due to the fact that most of the low quality paintings are probably anonymous works bought in the domestic market rather than abroad, while foreign paintings tend to be imported by rich collectors when they are of good quality and attributed to famous artists. To minimize this selection effect, we focus only on the analysis of attributed paintings, whose distribution across national schools is rather stable over time. In Fig. 4, we report the percentage difference between Spanish and Italian prices on the basis of a rolling regression with a full set of control variables. This shows that the price gap between Spanish paintings and Italian was extremely large at the beginning of the century, but was gradually eliminated during the development of the Spanish Golden Age (notice that such convergence is even more remarkable if there was still a selection effect on the quality of imported attributed works). This suggests that the increase in the demand for paintings that led to an increasing price may have determined an increase in the quality of domestic production, fostering the artistic innovations of

[33] According to Brown (1998, p. 98), the causes of the decline of Valencia "are undoubtedly related to the economic consequences of the expulsion of the Moriscos, which would have lessened the appeal of Valencia to painters from the outside. And even if foreign painters had been tempted to try their luck, they would have encountered the resistance of local artists, who were determined to eliminate the competition of foreigners by means of a college of painters. This college was formed in 1607 by a group including Ribalta and Sariñena and was probably influenced by the formation of the Academia de San Lucas in Madrid just three years earlier. However, the Valencian College can hardly be considered as liberal; like the guild it sought to supplant, it was motivated by a desire to prevent foreign (i.e., non-Valencian) painters from opening up shops in the city. Opposition to the college arose immediately, centered in the city council, which was rightly fearful that restraint of trade would lead to higher prices... For the most part, however, the Valencian painters kept their monopoly intact and their art insulated from the stimulating effects of new colleagues and ideas." While entry barriers led to decline, it was free entry in the market of Madrid to guarantee the success of its local artists.

what we now call the Golden Age of Spanish art.

Plate 5. Murillo, "Two women at a window" (ca. 1670;
National Gallery of Art, Washington D.C.).

A possible counterargument to our Schumpeterian hypothesis is that the price of domestic paintings may have been increasing and converging to the price of the international ones because of an increasing demand and preference for (both old and contemporary) Spanish art rather than because of an increasing quality supplied by the emerging Spanish artists. To discriminate between these two alternative hypothesis, our final test is run only on the subset of paintings attributed to Spanish painters (including Ribera)[34] and using additional information on the year of birth of the painters. Table 4 confirms the role of our usual control variables and the increasing trend of prices for the domestic production of paintings. However, the positive relation between price and year of birth of the painter confirms that it was the quality of new Spanish painters entering in the market that was increasing along the century, and not the general

[34] This does not affect our results (while increasing a bit the number of observations), and neither do alternative attributions to national schools.

Table 4: Price regression on Spanish painters

	Regression	
Year	0.238***	(0.057)
Date of Birth	0.233***	(0.060)
Interaction of Date of Birth with Year	-0.00014***	(0.00004)
Copy	-0.744***	(0.137)
Unknown genre	omitted	
Figurative	0.984***	(0.268)
Genre	0.417	(0.367)
Landscape	0.299	(0.300)
Portrait	0.735**	(0.274)
Still life	-0.021	(0.280)
Size unknown	omitted	
Size < 0.5 square meters	-0.251*	(0.136)
Size $0.5 - 1$ square meters	0.054	(0.131)
Size $1 - 1.5$ square meters	0.272*	(0.163)
Size $1.5 - 2$ square meters	0.635***	(0.215)
Size $2 - 3$ square meters	0.861***	(0.180)
Size $3 - 4$ square meters	0.943***	(0.241)
Size > 4 square meters	1.299***	(0.230)
Canvas	-0.178*	(0.103)
Lamina	0.690**	(0.295)
Wood	-0.017	(0.251)
Nr. paintings evaluated	-0.128***	(0.023)
Golden frame	-0.245***	(0.091)
Black frame	-0.071	(0.091)
Noble collector	0.763***	(0.091)
Constant	-389.9***	(96.06)
Observations	780	
Adjusted (R^2)	0.50	

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

preference for Spanish art. The interaction with the time trend also shows that this effect was stronger at the beginning of the period and was gradually reduced during the century: reading the coefficients properly one finds that painters born in 1590 will be paid 12% more than painters born a decade earlier, but 9% less than those born a decade later.[35]

Plate 6. Claudio Coello, "La Sagrada Forma" (1685-1690; El Escorial, Madrid).

In conclusion, the price of a representative painting evaluated in Madrid appears to have been rapidly increasing during the Baroque age (probably due to an increase in the demand for art), at an even higher rate when produced by domestic painters and even more for the younger artists active in the *Siglo de oro* of Spanish art.

[35] Within this specification we also detected some evidence of a "death effect" (see Ursprung and Wiermann, 2011) with prices increasing in the immediate years following the death of the painter. Further results are available from the authors.

4 Conclusion

We have analyzed art pricing in a unique dataset on Madrid inventories of the Baroque period. Prices appear to reflect the objective features of the paintings and of the collections. The hedonic price index has shown an impressive increasing pattern during the XVII century, but local paintings were priced below foreign ones at the beginning of the century. This price gap was gradually eliminated during the century and prices increased for more recent domestic painters, reflecting the artistic innovations of the Spanish Golden Age. In the subsequent century Madrid will remain a vital art center, still able to attract foreign masters (Giaquinto, Tiepolo and Mengs) and even to create a talent such as Goya at the end of the century, but the center of the artistic market and innovation will move to the north.

Elsewhere (Etro and Stepanova, 2013, 2015) we have found evidence of Schumpeterian patterns of artistic innovations in the contemporary Dutch market and in the French market between 700s and 800s. It would be interesting to extend similar tests to modern art as well.[36]

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Table 5: Artists fixed effects

Coef.	St.err	Obs	Name	Coef.	St.err	Obs	Name
Spanish school							
0.623	(0.433)	5	MURILLO, BARTOLOME ESTEBAN (1617 - 1682)	-0.341	(0.269)	13	CARRENO DE MIRANDA, JUAN (1614 - 1685)
0.551	(0.698)	2	ARCO, ALONSO DEL (1635 - 1704)	-0.354	(0.402)	7	HERRERA, FRANCISCO (1622 - 1685)
0.398	(0.418)	5	CANO, ALONSO (1601 - 1667)	-0.483	(0.503)	3	BECERRA, GASPAR (1520 - 1570)
0.358	(0.402)	5	LEONARDO, JUSEPE (1601 - 1656)	-0.492	(0.31)	19	ARELLANO, JUAN DE (1614 - 1676)
0.319	(0.592)	3	COELLO, CLAUDIO (1642 - 1693)	-0.527	(0.619)	2	ZURBARAN, FRANCISCO DE (1598 - 1664)
0.276	(0.354)	6	FERNANDEZ DE NAVARRETE (EL MUDO) (1526 - 1579)	-0.629**	(0.257)	16	PEREDA Y SALGADO, ANTONIO (1611 - 1678)
0.0289	(0.336)	7	MORALES, LUIS DE (EL DIVINO) (1512 - 1586)	-0.630**	(0.304)	12	FERNANDEZ, JUAN (EL LABRADOR)
0.0116	(0.279)	16	CEREZO, MATEO (THE YOUNGER) (1637 - 1666)	-0.709***	(0.23)	26	NUNEZ, PEDRO (1635 - 1700)
-0.001	(0.229)	18	CARDUCHO, VICENCIO (1585 - 1638)	-0.768**	(0.303)	12	TORRES, MATIAS DE (1635 - 1711)
-0.108	(0.521)	3	MENENDEZ, MIGUEL JACINTO (1679 - 1734)	-0.803	(0.677)	2	ARIAS FERNANDEZ, ANTONIO (1614 - 1684)
-0.121	(0.136)	78	ORRENTE, PEDRO (1580 - 1644)	-0.833***	(0.253)	17	TOLEDO, JUAN BAUTISTA DE (1611 - 1665)
-0.202	(0.26)	16	NARDI, ANGELO (1584 - 1664)	-0.954**	(0.394)	6	ANTOLINEZ, JOSE (1635 - 1676)
-0.214	(0.606)	2	MAZO, JUAN BAUTISTA MARTINEZ DEL (1612 - 1667)	-0.957***	(0.178)	43	CAXES, EUGENIO (1577 - 1642)
-0.226	(0.418)	5	CAMILO, FRANCISCO (1610 - 1671)	-1.075***	(0.407)	5	AGUERO, BENITO MANUEL DE (1626 - 1670)
-0.26	(0.345)	9	ESCALANTE, JUAN ANTONIO DE FRIAS Y (1633 - 1669)	-1.201***	(0.229)	50	HAMEN Y LEON, JUAN VAN DER (1596 - 1631)
-0.286	(0.183)	31	GRECO, EL (DOMENICO THEOTOCOPULI) (1541 - 1614)	-1.246*	(0.641)	2	PALOMINO DE CASTRO Y VELASCO (1653 - 1726)
-0.326*	(0.18)	33	SANCHEZ COELLO, ALONSO (1531 - 1588)	-1.298***	(0.393)	6	PONCE, ANTONIO (1608 - 1677)
-0.327**	(0.165)	46	VELAZQUEZ, DIEGO RODRIGUEZ DE SILVA (1599 - 1660)	-1.345***	(0.394)	5	RIBALTA, FRANCISCO (1565 - 1628)
-0.327	(0.288)	12	COLLANTES, FRANCISCO (1599 - 1656)	-1.746***	(0.606)	2	PRADO, BLAS DEL (1540 -)
Flemish and Dutch schools							
0.627***	(0.139)	64	DYCK, ANTHONIE VAN (1641 - 1641)	-0.0443	(0.219)	19	VOS, PAUL DE (1591 - 1678)
0.432***	(0.125)	82	RUBENS, PETER PAUL (1577 - 1640)	-0.209	(0.604)	2	BROUWER, ADRIAEN (1638 - 1638)
0.395**	(0.2)	28	SNYDERS, FRANS (1657 - 1657)	-0.23	(0.312)	8	BOSCH, HIERONYMUS VAN AKEN (1450 - 1516)
0.389**	(0.164)	62	BRUEGHEL	-0.266	(0.233)	18	BRIL, PAUL (1626 - 1626)
0.371	(0.608)	2	FYT, JAN (1661 - 1661)	-0.282	(0.274)	13	ARTHOIS, JACQUES D' (1613 - 1686)
0.309	(0.454)	3	IJKENS, FRANS (1601 - 1693)	-0.302	(0.611)	2	BLOEMAERT, ABRAHAM (1651 - 1651)
0.285	(0.293)	9	MOR, ANTHONIS (1516 - 1575)	-0.33	(0.531)	3	VOS, MARTEN DE (1532 - 1603)
0.149	(0.593)	2	FRANCKEN, FRANS (1581 - 1642)	-0.396**	(0.201)	32	CORTE, JUAN DE LA (1597 - 1660)
0.1	(0.428)	3	LUCAS VAN LEYDEN (1494 - 1533)	-0.435	(0.398)	5	LAER, PIETER VAN (BAMBOCCIO) (1592 - 1642)
0.016	(0.236)	15	SEGHERS, DANIEL (1661 - 1661)	-0.912**	(0.433)	4	FLORIS, FRANS (I) (1570 - 1570)
0.01	(0.261)	13	TENIERS, DAVID (THE YOUNGER) (1610 - 1690)	-1.768***	(0.591)	2	SMIDT, ANDRES DE (1625 - 1680)

Artists fixed effects (continued)

Coef.	St.err	Obs	Name	Coef.	St.err	Obs	Name
Italian school							
1.204***	(0.198)	24	CORREGGIO (1489 - 1534)	0.14	(0.177)	26	RENI, GUIDO (1575 - 1642)
1.136***	(0.421)	4	GIULIO ROMANO (1499 - 1546)	0.139	(0.26)	10	PARMIGIANINO (1503 - 1540)
0.960***	(0.162)	39	RAFFAELLO SANTI (1483 - 1520)	-0.0101	(0.495)	3	ZUCCARI, TADDEO (1529 - 1566)
0.912*	(0.469)	4	GRAMATICA, ANTIVEDUTO (1571 - 1626)	-0.0525	(0.308)	6	CESARI, GIUSEPPE (CAVALIER D'ARPINO) (1568 - 1640)
0.743*	(0.431)	4	CARRACCI, ANNIBALE (1560 - 1609)	-0.0966	(0.448)	4	SASSOFERRATO GIOVANNI BATTISTA (1609 - 1685)
0.696*	(0.382)	5	PORDENONE (1484 - 1539)	-0.123	(0.207)	30	CODAZZI, VIVIANO (1606 - 1672)
0.693***	(0.175)	29	VERONESE (1528 - 1588)	-0.145	(0.242)	14	FALCONE, ANIELLO (1600 - 1656)
0.665***	(0.213)	19	CARAVAGGIO, MICHELANGELO (1571 - 1610)	-0.187	(0.31)	8	TEMPESTA, ANTONIO (1555 - 1630)
0.660**	(0.298)	9	STANZIONE, MASSIMO (1586 - 1656)	-0.227	(0.174)	30	CAMBIASO, LUCA (1527 - 1585)
0.564**	(0.28)	10	BASSANO, JACOPO (1510 - 1592)	-0.237	(0.266)	9	GUERCINO GIOVANNI FRANCESCO (1591 - 1666)
0.484	(0.354)	6	BAROCCI, FEDERICO (1526 - 1612)	-0.334	(0.603)	2	GENTILESCHI, ARTEMISIA (1593 - 1656)
0.481***	(0.118)	137	TIZIANO (1488 - 1576)	-0.376	(0.315)	8	VACCARO (1600 - 1670)
0.458***	(0.128)	109	TINTORETTO (1518 - 1594)	-0.552**	(0.228)	14	ANDREA DEL SARTO (1486 - 1530)
0.446	(0.388)	7	SARACENI, CARLO (1579 - 1620)	-0.564	(0.446)	4	BONZI, PIETRO PAOLO (1576 - 1636)
0.395	(0.244)	14	LEONARDO DA VINCI (1452 - 1519)	-0.615	(0.586)	2	CARRACCI, AGOSTINO (1557 - 1602)
0.31	(0.429)	4	MICHELANGELO BUONARROTI (1475 - 1564)	-0.701*	(0.421)	4	SEBASTIANO DEL PIOMBO (1485 - 1547)
0.305	(0.34)	7	BORGIANNI, ORAZIO (1574 - 1616)	-0.795**	(0.385)	5	BELLINI, GIOVANNI (1430 - 1516)
0.241**	(0.12)	144	BASSANO (1510 - 1592)	-0.817*	(0.425)	3	ANGUISSOLA, SOFONISBA (1532 - 1625)
0.227	(0.217)	16	PALMA (1544 - 1628)	-0.844	(0.598)	2	PIETRO DA CORTONA (1596 - 1669)
0.218	(0.201)	51	GIORDANO, LUCA (1634 - 1705)	-0.897*	(0.493)	3	LANFRANCO, GIOVANNI (1582 - 1647)
0.191	(0.488)	2	GIORGIONE (1477 - 1510)	-1.590***	(0.34)	7	CARBONI, LUIGI
0.183	(0.274)	14	NUZZI, MARIO (1603 - 1673)				

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses. Omitted painter: RIBERA, JUSEPE (LO SPAGNOLETTO)

Table 6: Collectors fixed effects

Coef.	St.err	Obs	Year	Name	Coef.	St.err	Obs	Year	Name
2.464***	(0.404)	6	1674	*Jeronimo de Cuellar*	0.769***	(0.276)	24	1635	*Francisco de Eraso*
2.284***	(0.208)	446	1689	*Gaspar de Haro y Guzman*					I Conde de Humanes
				VII Marques de Eliche, Duque de Montoro,	0.763**	(0.331)	13	1678	*Luis de Zabalza*
				Conde-Duque de Olivares,	0.761***	(0.263)	30	1655	*Miguel de Salamanca*
				Conde de Morente, VII Marques del Carpio	0.752*	(0.423)	5	1676	*Gregorio Ortiz de Santecilla*
1.934***	(0.349)	10	1703	*Sebastian de Cotes y la Carcel*	0.674**	(0.319)	19	1726	*Nicolas Gonzalez de Villa*
1.751***	(0.352)	9	1669	*Ramiro Felipez de Nunez de Guzman*	0.655*	(0.343)	12	1666	*Antonio de Mardones*
				Duque de Sanlucar la Mayor,	0.626***	(0.217)	192	1655	*Diego Messia*, Marques de Leganes
				Duque de Medina de las Torres	0.599	(0.619)	3	1727	*Francisca Josefa Fernandez Davila y Cordoba*
1.709***	(0.633)	2	1628	*Juan de Matute*, Doctor					Marquesa de Arcicollar y Baides
1.564***	(0.28)	37	1694	*Juan de Castaneda*	0.543	(0.341)	10	1747	*Isabel Maria de la Cruz Ahedo*
1.562***	(0.529)	5	1729	*Joseph Francisco Sarmiento Velasco*					widow of Juan Francisco de Goyeneche,
				Conde de Salvatierra y Pie de Concha,					Marques de Ugena y Torrejoncillo, del Consejo de Su
				Marques del Sobroso					Majestad en el Real de Hacienda y ,
1.383***	(0.442)	5	1697	*Pedro Colmenares Trezeno*					Mayordomo de la Reina, Caballero de Santiago
1.366***	(0.342)	10	1674	*Diego de la Torre*, Secretary	0.523	(0.477)	4	1652	*Fernando de Tinoco and Violante Correa*
1.308***	(0.226)	120	1691	*Juan Gaspar Enriquez de Cabrera*	0.503	(0.367)	9	1666	*Catalina Velasco de Villarin*
				Duque de Medina de Rioseco, X Almirante de Castilla					widow of Cristobal Gonzalez Cossio de la Hoz,
1.221*	(0.626)	2	1651	*Francisco de Prado Bravo de Mendoza*					Secretario de Su Majestad y Su Contador de Resultas,
1.215***	(0.253)	39	1675	*Antonio Mesia de Tovar*, Conde de Molina					Caballero de Alcantara
1.179***	(0.294)	20	1734	*Gaspar Carculli*, Doctor	0.503	(0.315)	16	1746	*Francisco del Olmo*
1.131***	(0.258)	32	1693	*Manuel Ponce de Leon*, Duque de Arcos	0.486*	(0.285)	22	1641	*Philippe Charles d'Arenberg*
1.120***	(0.231)	77	1653	*Manuel de Fonseca y Zuniga*					Duc d'Aarschot, Prince-Comte d'Arenberg
				Conde de Fuentes y de Monterrey	0.447	(0.289)	25	1671	*Francisco Gonzalez Cossio de la Hoz*
1.082***	(0.33)	11	1655	*Leonor Maria de Guzman*	0.431	(0.323)	17	1663	*Francisco de Oviedo*
				Condesa de Fuentes y de Monterrey	0.398	(0.317)	14	1748	*Petronila Antonia de Torres y Bricianos*
0.863*	(0.477)	5	1678	*Pedro de Vallejo*					wife of Joseph Manuel Franco,
0.822*	(0.448)	7	1746	*Teresa Diaz Rodero*					Brigadier de los Rentes Ejercitos de Su Majestad,
				widow of Luis Sanchez, Abogado de los Reales Consejos					Furriel Mayor del Regimiento de
0.805**	(0.339)	9	1678	*Ana Maria de Lezama*					Guardias de Infanteria Espanola
				widow of Joseph Pardo de Figueroa,	0.271	(0.309)	17	1662	*Pedro Pacheco*, Doctor
				de los Consejos de Castilla y Guerra	0.27	(0.275)	21	1683	*Andres Villaran*
0.775**	(0.302)	21	1679	*Bartolome de Legasa*	0.269	(0.72)	2	1744	*Joseph Spino y Navarro*

Collectors fixed effects (continued)

Coef.	St.err	Obs	Year	Name	Coef.	St.err	Obs	Year	Name
0.18	(0.522)	3	1685	*Catalina Velez de Guevara*	-0.36	(0.269)	24	1635	*Francisca Luisa Fernandez Portocarrero and*
				Condesa de Villamediana,					*Antonio Moscoso Osorio*
				Marquesa de Guevara, IX Condesa de Onate					Marquesa and Marques de Villanueva del Fresno y Barcarrota
0.155	(0.297)	20	1750	*Miguel Antonio de Zuaznabar*	-0.378	(0.369)	10	1650	*Agustin de Arellano and Francisca de la Torre*
0.146	(0.383)	7	1657	*Arthanasio Jimenez de Arellano*	-0.393	(0.457)	5	1747	*Miguel de San Miguel y Torneria*
0.124	(0.327)	17	1711	*Nicolas Gonzalez de Villa*	-0.459*	(0.272)	25	1648	*Catalina Fernandez de Cordoba y Aragon and*
0.119	(0.3)	19	1648	*Garci Gallo de Escalada Olaso y Manrique*					*Luis Mendez de Haro y Guzman*
0.118	(0.347)	9	1724	*Andres de Medrano y Mendizabal*, Conde de Torrubia					Condesa-Duquesa and Conde-Duque de Olivares,
0.104	(0.422)	5	1662	*Antonio Carnero*					Condesa and Conde de Morente,
0.0407	(0.296)	17	1643	*Pedro de Arce*					IV Marquesa and VI Marques del Carpio
		64	1664	Montero de Camara de Su Majestad	-0.486	(0.297)	19	1639	*Sebastian Diaz de Ontiveros and*
0.0297	(0.46)	4	1621	*Regente Montoya de Cardenas*					*Ana Maria Nunez de Cos*
0.0257	(0.265)	31	1682	*Joseph Salvador Sarmiento*,	-0.550*	(0.306)	16	1657	*Maria Tufino de Vallejo*
				Conde de Salvatierra, Marques del Sobroso					wife of Pedro de Arce, Montero de Camara de Su Majestad;
-0.00703	(0.311)	15	1680	*Joseph Marquez de Escalante*					widow of Tomas de Rueda, Santo Oficio de la Inquisicion
-0.105	(0.214)	180	1647	*Juan Alfonso Enriquez de Cabrera*	-0.57	(0.365)	8	1618	*Gaspar de Ledesma Merino*
				Duque de Medina de Rioseco, IX Almirante de Castilla	-0.638*	(0.357)	8	1679	*Pedro Portocarrero*, Conde de Medellin
-0.127	(0.343)	9	1741	*Juan Bautista Marquez*	-0.641	(0.52)	3	1687	*Juan de Echauz*
-0.153	(0.473)	4	1680	*Maria de Baeza*, widow of Pablo Cani	-0.652**	(0.309)	14	1636	*Cristobal Gonzalez Cossio*
-0.184	(0.361)	9	1710	*Juan Antonio Licenciado Vicuna*					Secretario de Su Majestad y Su Contador de Resultas,
-0.255	(0.28)	27	1655	*Andres de Villarreal*					Caballero de Alcantara
-0.255	(0.427)	5	1664	*Luisa de Sandoval, Duquesa de Medina de Rioseco*	-0.692	(0.429)	5	1657	*Margarita Caxesi Giliocis*, wife of Joseph de Cisneros
				widow of Juan Alfonso Enriquez de Cabrera,	-0.727	(0.535)	3	1656	*Francisco Diaz de la Hoz and Isabel Nunez*
				Duque de Medina de Rioseco, IX Almirante de Castilla	-0.743***	(0.26)	32	1609	*Pompeo Leoni*
-0.275	(0.544)	3	1736	*Manuel de Cordoba y Verdes*	-0.818***	(0.277)	27	1639	*Jeronimo de Alviz*
-0.281	(0.338)	10	1666	*Jeronima de Villarreal*	-0.835***	(0.285)	20	1666	*Fernando de Borja y de Aragon*
				wife of Joseph Mensa, Secretario de Su Majestad,					Principe de Esquilache,Conde de Simari,III Conde de Mayalde
				Escribano Mayor de Registro de Su Consejo	-1.007***	(0.365)	8	1632	*Alonso Cortes*, Doctor
				Supremo de Aragon, Oficial Mayor de la Secretaria	-1.057**	(0.523)	3	1632	*Pedro Fernandez de Navarrete*
				de la Negociacion del Reino de Cerdena	-1.133***	(0.388)	9	1681	*Joseph de Lezana*
-0.331	(0.31)	13	1638	*Vicencio Carducho*	-1.610***	(0.538)	3	1654	*Luis Fernandez de Vega*
-0.362	(0.25)	58	1644	*Domingo Soria Arteaga*					

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses. Omitted collector: Pedro Nunez de Guzman, Conde de Villaumbrosa, Marques de Montealegre