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Century Italian Art Sector**

Federico Etro, Silvia Marchesi and Laura Pagani

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# The Labor Market in the Seventeenth-Century Italian Art Sector \*

Federico Etro\*, Silvia Marchesi† and Laura Pagani†

\* University of Venice, Ca' Foscari

† University of Milan, Bicocca

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## Abstract

We analyze the labor market for painters in Baroque Rome using unique panel data on primary sales of still lifes, portraits, genre paintings, landscapes and figurative paintings. In line with the traditional artistic hierarchy of genres, average price differentials between them were high. We identify supply and demand factors related to prices of paintings. The panel dimension of the dataset and its matched painter-patron nature allows us to evaluate the extent to which price heterogeneity is related to unobservable characteristics of painters and patrons. We find that most of the inter-genre price differential is explained by the variation in average artist heterogeneity across genres. This suggests that the market allocated artists between artistic genres to the point of equalizing the marginal return of each genre. We also explain residual price differences in terms of efficiency wage, signalling and incentive mechanisms to induce effort in the production of artistic quality.

Keywords: Art market, Occupational choice, Wage equalization, Signalling

JEL Classification: C23, D8, J3, Z11

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“Caravaggio said that it takes as much manufacture to do a good painting of flowers as of human figures,” Vincenzo Giustiniani, Letter on painting (1620-1630)

## 1 Introduction

Rational and equilibrium behavior has characterized economic phenomena since the development of free market economies, but the lack of reliable data on ancient markets has made it difficult to test economic theories in historical contexts. The art market is an interesting exception, for which data on prices, contracts and supply and demand factors are available from art historical studies and economic investigations start to emerge (see De Marchi, 1995; Montias, 2002; Etro and Pagani, 2012). In this paper we analyze the labor market for painters based in Rome (the leading art center of the Western world at the time) through unique panel data on paintings of the Baroque age, which allows us to focus on the (occupational) choice of the artistic genre by painters and equilibrium pricing across art sectors.

The most impressive and rapid phenomenon of the XVII century art industry has been the innovative form of artistic differentiation that led to the mass production of new genres of paintings. Besides traditional figurative paintings, which here we define as including religious, mythological and historical subjects, and besides portraits, the new genres of the Baroque art market included still lifes (reproducing animals, fruits, flowers and lifeless objects), landscapes (reproducing the countryside or the urban environment), so-called genre paintings (reproducing daily life scenes) and battles (reproducing fights without necessarily a specific historical content). Each genre represented a specific sector of production, and painters either specialized in one or few genres or they could switch between them according to market opportunities. The prestige of the genres was rigorously ranked in the artistic culture of the time.

The most dignified and worthy subjects were those depicting creative compositions of idealized human figures, followed by idealized landscapes. Compositions of the daily aspects of reality (the so-called genre paintings) were at a lower level, while the least worthy genres were those imitating reality without idealization, like portraits and, at the lowest level, still lifes (Spear and Sohm, 2010, p. 91). Such a ranking was well understood between art critics, art collectors and artists, and later codified by the art academies (Félibien, 1668). A preliminary look at our data on primary sales of paintings in Baroque Rome does suggest that this hierarchy of genres was also associated with a clear ranking of payments among the different genres. Price differentials between them were sizable: the average prices in Roman silver *scudi* were, respectively, 17 *scudi* for still lifes, 25 for genre paintings, 39 for portraits, 66 for landscapes and 240 for figurative

paintings.

Paintings of different genres obviously differed in many respects (e.g., size, technique, support, destination) and price differentials did not necessarily reflect differences in the effective compensation of the painters. However, as long as the market was competitive and painters could freely choose whether to specialize in one genre or switch between genres to exploit profitable opportunities, we can hardly imagine that systematic compensation differentials could persist between artistic sectors. For instance, if effective payments for landscapes were above those paid for still lifes of equivalent features because buyers had a relative preference for landscapes, we would simply expect more painters to paint landscapes until the price differential disappears, eliminating any profitable opportunities. In other words, in equilibrium painters should be allocated between commissions to the point of equalizing the marginal return of each genre.

Our main objective is to test this hypothesis of price equalization between genres. To do so we adopt a labor market framework in which genres are interpreted as industries, patrons as the employers and painters as the workers.<sup>1</sup> If artists's mobility between artistic fields (genres) was endogenous, we expect that, after controlling for demand and supply side features, any price differential between paintings of different genres should disappear. In labor economics, a similar hypothesis is known as wage equalization between sectors and firms, and there is a wide empirical literature testing its validity (e.g., Dickens and Katz, 1987; Murphy and Topel, 1987; Krueger and Summers, 1988; Abowd, Kramarz and Margolis, 1999, hereafter AKM; Manning, 2003). In modern labor markets, wide wage differentials across sectors (and firms) have been observed for observationally similar workers and they can hardly be explained on the basis of competitive theories of the labor market.<sup>2</sup> Once controlling for the observable characteristics of workers and jobs, there is a variety of reasons which may explain the existence of wage differentials across both sectors and firms such as the imperfect mobility of workers (e.g., search frictions, networks), compensating wage differentials and efficiency wages/rent sharing.<sup>3</sup> The main empirical problems in explaining wage differentials typically rely on the difficulty of obtaining a detailed matched employer-employee dataset about a competitive labor market and observing the same worker employed in multiple sectors and in different firms (without selection on workers switching jobs). The advantage of analyzing an artistic labor market is that we

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<sup>1</sup>We should emphasize that, rather than wages (for instance annual wages, as in the standard labor market literature) our data report the price of each single item (painting) produced by each artist. Therefore, we take the compensation for each painting (i.e., the painting price) as the worker's wage for that commission. In labor economics terms, we would define it as a compensation at a piece rate rather than at a time rate.

<sup>2</sup>Which is true also in the case of highly skilled workers such as the painters of our dataset (e.g., see Bertrand, Goldin and Katz, 2010).

<sup>3</sup>For example, Brown and Medoff (1989) discussed all these explanations in their survey.

observe workers (painters) that are constantly switching between artistic fields (genres of paintings) and between employers (patrons). Moreover, since old masters received a similar general training and the differences in productivity and artistic talent (or in reputation) were typically worker-specific, we can fully capture them through artists fixed effects.

Our empirical analysis is based on a unique panel data on painters active in Rome in the XVII century, drawn from the database put together by the art historian Richard Spear and administered by the Getty Research Institute (see Spear and Sohm, 2010)<sup>4</sup>. It is a matched employer-employee (patron-painter) dataset and hence it allows to analyze the inter-industry (genre) price differential exploring the role of worker (artist) and firm (patron) heterogeneity in the determination of painters' compensation. Moreover, unlike in the standard literature in labor economics (see, for example, AKM), in which each firm could be classified into a single industry only, our data allow us to identify sectors and patrons disjointly since each patron could commission paintings belonging to different genres (or sectors).<sup>5</sup>

We find that most of the inter-genre price differential is explained by the variation in average individual heterogeneity across artistic sectors. This suggests that the labor market for painters was rather competitive and allocated artists between genres to the point of equalizing the marginal return of different genres. We find some evidence of residual price differential at the employer level, though, which we mainly explain in terms of efficiency wage and incentive mechanisms to induce effort in the production of artistic quality (Weiss, 1980; Shapiro and Stiglitz, 1984). In some cases, as for St Peter's Basilica or major noble families (the Medici, the Gonzaga and foreign kings), higher prices were paid by some patrons to induce more effort and to select highly-talented painters, thus sorting artists into patrons with different observed compensation programs.

We also find a number of additional results on equilibrium pricing. Some of them are related to the moral hazard problem emerging in contractual relations in which effort of the painters and final quality of the paintings were not contractable *ex ante* or verifiable *ex post*. First, in the case of figurative paintings, we show that patrons and artists adopted a typical solution pointed out in the literature on principal-agent contracts (based on the "informativeness principle" of Holmstrom, 1979): prices were made conditional on measurable features of the paintings which were positively correlated with effort and quality, one of which was the number of human figures

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<sup>4</sup>See in particular Spear (2010) for an accurate description of the dataset, for art historical considerations on the general pricing patterns for each genre and on the earnings of the painters.

<sup>5</sup>One possible limitation, however, related to applying a labor market perspective to this context may depend on the fact that the demand for painting/artist expressed by the patrons is a demand for consumption and not for production. Thus, in our setting, an alternative explanation for the existence of a price difference at the employer level (which does not hold in a labor market framework) may depend on some limited capacity at the patron level.

depicted in the composition. Second, in line with the signalling theory in art pointed out by Nelson and Zeckhauser (2008), we find a price premium for paintings destined to public display as in private chapels (within churches) compared to paintings destined to private palaces and private collections: signalling “magnificence” with works of high quality required stronger incentives. Moreover, in line with a basic form of price discrimination, we also find evidence of quantity discounts for multiple commissions. As a residual result, we emphasize that the best paid artists (for works of similar objective characteristics and destination) included famous masters such as Maratta, Pietro da Cortona, Guido Reni, Caravaggio, Vouet, Lorrain and Poussin. On average, their rewards were increasing with age, consistently with the Galenson hypothesis of a positive relation between age of experimental artists and quality as priced by the market (see Galenson and Weimber, 2000, 2001, and Galenson, 2006).<sup>6</sup>

The paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 describes product differentiation in the market for paintings and the economic hypothesis to be tested. Section 4 presents the dataset and the sample. Section 5 describes the empirical strategy and the results. Finally, Section 6 concludes.

## 2 Related literature

Our work is related to two main strands of literature, one at the borders between economic history and art history and one within labor economics focusing on inter-industry (and firms) compensation differentials.

Economic history research by Montias (1982, 2002), Chong (1987), De Marchi (1995) and North (1999) has emphasized the importance of economic incentives in shaping the XVII century art market, but its focus has been mainly on the Dutch market, which was characterized earlier by an even deeper specialization in new and different genres compared to Italy.<sup>7</sup> There are still substantial data on the prices of paintings sold in auctions (or recorded in inventories) in Dutch towns during the XVII century,<sup>8</sup> but unfortunately, there are virtually no data on the original contracts between painters and buyers, which makes it impossible to analyze the primary market of the Dutch golden age.

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<sup>6</sup>For econometric evidence on this in modern art see Galenson and Weinberg (2000, 2001).

<sup>7</sup>This is also due to iconoclasm, which limited commissions of religious subject in churches. In the Netherlands, landscapes rapidly became the most representative paintings in private collections, and even still lifes were highly regarded (see Hochstrasser, 2007).

<sup>8</sup>For instance, in the first quarter of the century, Chong (1987) records average prices of 27 guilders for still lifes and genre paintings, 30 and 41 guilders for respectively landscapes and architectural subjects and 48 and 33 guilders for paintings of respectively historical and religious subject (with only 6 guilders for portraits).

Less systematic have been the investigations on the Italian art market, mainly for the lack of comparable data until recently. The traditional studies on the social and economic aspects of art history have provided wide descriptions of the economic conditions of artists and patrons and anecdotal evidence on the pricing of paintings and art objects (at least since the work on the Renaissance art market by Wackernagel, 1938), but without a systematic analysis of the available data. Only recently, art historical research by O'Malley (2005) and Spear and Sohm (2010) have put together and analyzed datasets on primary sales in the Italian art market during the Renaissance and Baroque periods, respectively, but this analysis presents only descriptive evidence and does not test economic hypothesis.

In a related work, Etro and Pagani (2012) have analyzed the Venetian market for figurative paintings in the wider period 1550-1750 through econometric analysis of a unique dataset containing prices derived from the original contracts of painters active in the Venetian Republic. This work shows that trade in paintings was sufficient to equalize prices between different destinations, such as Venice, minor towns and the countryside of the Venetian Republic or foreign destinations (exports), which suggests that competition between painters eliminated profitable opportunities associated with demand differences in different geographical markets. Artists' rewards were increasing with age, consistently with the hypothesis of experimental innovation of Galenson (2006). These results are confirmed in a limited dataset from Central Italy (namely Florence, Bologna, Rome and Naples) during the Baroque age.

The second stream of related literature regards wage differentials in contemporary labor markets. Generally speaking, the existing evidence shows that large wage differentials across sectors and across firms for observationally similar workers and jobs can be hardly explained on the basis of competitive theories of the labor market. The early literature on the inter-industry wage differentials (among others see Dickens and Katz, 1987; Murphy and Topel, 1987; Krueger and Summers, 1988; Gibbons and Katz, 1992; Haisken-DeNew and Schmidt, 1997) has shown that these differentials persist after controlling for observable worker, job or firm characteristics.<sup>9</sup> However, there is controversy regarding the extent to which they can be explained by unobservable worker effects. For example, Krueger and Summers (1988) found evidence that inter-industry wage differentials remain even after controlling for constant and unmeasured worker characteristics (ability). They relied on efficiency wage theories as an explanation for this result, suggesting that workers in high wage industries receive non-competitive rents. Murphy and Topel (1987) looked at workers switching job and found no inter-sectoral wage differentials; however, their result may depend on the selection concerning workers that switch jobs. Accord-

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<sup>9</sup>A related literature is about the positive relation between size of firms and wages within sectors (see Mellow, 1982, and Brown and Medoff, 1989).

ing to Dickens and Katz (1987), efficiency wage mechanisms are likely to explain most of the inter-sectoral wage differentials. More recently, AKM readdress the topic of wage differentials by using unique longitudinal matched employer-employee data of French workers and firms. Given the matched nature of their panel, they can control simultaneously for workers and firms heterogeneity, and they find that most of the inter-industry wage differential is explained by worker effects.

A possible limit of their empirical analysis may depend on the pervasiveness of unionization and collective bargaining in the modern French labor market. We perform a similar analysis in a historical market without any effective unionization between workers (guilds existed but they hardly affected pricing behavior) and characterized by direct bargaining between any couple of worker and employer for every single job. The advantage of analyzing a primary artistic market through a matched employer (patron)-employee (painter) dataset is that we can observe workers (painters) that are constantly switching between sectors (genre of paintings) and between employers (patrons). In other words, they could be defined as high skilled workers in modern labor markets. Moreover, we are able to identify sectors and patrons disjointly, since each patron could commission paintings belonging to different genres (or sectors).<sup>10</sup>

Our main contribution is then related to the specific features and to the novelty of the data which allow us to analyze, for the first time, an historical labor market of high skilled workers. Despite being different in many ways with respect to a modern labor market, our analysis allows us to draw similar conclusion regarding its degree of competitiveness, which is our case, is found to be high across sectors but low across employers.

### 3 Price equalization between genres of paintings

Most paintings during Renaissance were of figurative subject, mainly religious or mythological, but also allegorical, literary or strictly historical (including battles drawn from a real or invented context), and we define them as figurative paintings in general. Since the end of the XVI century, however, the raising demand of private buyers belonging to the high and middle classes (and the influence of Flemish art) led to the development of new artistic fields (genres). The pressure for horizontal differentiation induced even additional specialization within genres, leading to special submarkets for still lifes of flowers, fruits, game, fish or *trompe-l'oeil* and so on, to submarkets for landscapes focused on seascapes, rural scenes, views of the countryside with classic ruins, *vedute* (cityscapes), on *capricci* (imaginary views) and more, or genre paintings focused on high class

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<sup>10</sup>In labor terms, sector or industry is a characteristics of the firm, thus the definition of the pure industry effect (for example in AKM) is simply the correct aggregation of the pure firm effect within the industry.



life, low class life or *bambocciate* (grotesque situations).<sup>11</sup> Many painters were mainly, but not exclusively, specialized in one of these artistic sectors, others were often engaged in combinations of them, and many more were switching genres repeatedly in their careers (think of Caravaggio, Annibale Carracci or Salvator Rosa to cite famous eclectic artists). This should not be surprising in the Italian artistic tradition because most painters received a broad initial training on all these subjects since Renaissance time (Wackernagel, 1938). Moreover, competition between painters was fierce and painters were ready to adapt to the needs of the commissioners and change artistic field in order to win a contract.

While nowadays we are not used to artistic hierarchies based on paintings' subject, in the XVII century the prestige of the different artistic genres was clearly ranked. The least worthy subjects were still lifes, imitating reality without idealization (Spear and Sohm, 2010, p. 91). The position of portraits in this hierarchy was variable, but often at a low level for the alleged absence of creativity in works aimed at merely copying real human figures. Genre paintings were equally penalized by the lack of decorum and idealization and the typical focus on the worst aspects of life, which was considered vile by contemporary artists and critics (Spear and Sohm, 2010, p. 94). Landscapes and (even more) battles were more valuable than these genres, but the most dignified and worthy subjects were those depicting creative compositions of ideal human figures (Spear and Sohm, 2010, p. 91), like religious or mythological paintings.

Despite some heterogeneity in preferences, there is wide documentary evidence that such a ranking was well understood between art critics,<sup>12</sup> art collectors,<sup>13</sup> artists and intellectuals.<sup>14</sup> Later in the century, it was even codified by the art academies (see for instance Félibien, 1668).<sup>15</sup> The prestige of different genres was closely correlated with the fame of painters. The

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<sup>11</sup>Genre paintings have a figurative content (include typically a small number of human figures), but they are traditionally separated from paintings of historical subject for their focus on contemporary life (occasionally also battles are associated with them in art historical studies).

<sup>12</sup>The art critic Giulio Mancini (1588-1630), in a famous treatise on painting aimed at noble amateurs, *Considerazioni sulla pittura* (1619, see Mancini, 1956), explicitly distinguished between categories of paintings based on the nature of the objects imitated.

<sup>13</sup>An articulated ranking was stated at the beginning of the century by Vincenzo Giustiniani (1564-1637), a famous art collector. In a letter, he distinguished twelve "categories, concerning the methods of painting and the rankings of painters" with a clear hierarchy (for the English translation of the letter to Theodor Amayden by Giustiniani see Enggass and Brown, 1970, pp. 16-20). The worst three categories, or "methods" concerned copies. At a higher level of Giustiniani's ranking were portraits and still lifes. At an even higher level he placed different kinds of landscape paintings. The best categories were about figurative paintings, including battles and, a step above, historical subjects divided in subcategories differentiated only from a stylistic point of view. Similar views were expressed by other experts in the following decades, also with minor changes in the perceived ranking.

<sup>14</sup>Genre paintings and still lifes had been explicitly considered vile subjects by artists such as Andrea Sacchi, Francesco Albani and Salvator Rosa and intellectuals such as Giovan Pietro Bellori, Giovanbattista Passeri and Camillo Massimi (Spear and Sohm, 2010, p. 94).

<sup>15</sup>The hierarchy of genres became a source of intellectual debate in the European art academies as the Accademia del Disegno in Florence, the Accademia di San Luca in Rome or the Académie des Beaux-Arts in Paris. A shared view was later codified in a famous lecture given by the art critic André Félibien (1668) at the French Academy.

most acclaimed artists were mainly specialized in historical subjects and they reached the highest payments for their paintings, while minor painters were specialized in still lifes and genre paintings and they received lower fees for their paintings.<sup>16</sup>

Nevertheless, since the basic training (in different genres and techniques) was more or less common to most painters, as long as the market was competitive and the alternative artistic genres were open to the entry of new painters, we can hardly imagine that systematic differences in prices could persist over time between different genres. Painters of different talent could perfectly choose to be active in different fields, but if a given painter could earn more by switching between genres, he would do it whenever a painting in a different genre could provide a higher payment.<sup>17</sup> A typical arbitrage argument would then suggest that, after controlling for supply factors, especially experience and talent (reputation) of painters but also objective characteristics of the paintings such as size, technique or support, and for demand factors such as the type of commissioner or the kind of destination, any price differential between paintings of different genres should disappear.<sup>18</sup> In other words, a square meter of painted canvas commissioned to the same painter from the same patron under the same conditions should be priced independently from what it represents.

### 3.1 Price determinants: the supply-side

To test the hypothesis of price equalization between genres, we need to identify the main supply and demand factors that may have affected prices in the market for paintings of Baroque Rome. On the supply side, the price of paintings depends first of all on the talent (and the reputation) of the painter, which is obviously painter-specific and possibly changing with the maturity of each painter. The latter may reflect an age/earning profile dependent on reputational effects emerging with activity in the profession or on actual improvements (artistic innovations perceived and priced by the market) correlated with experience (Galenson and Weinberg, 2000; Galenson,

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His influential hierarchy of the genres, ranked still lifes in the lowest position and figurative paintings at the highest level.

<sup>16</sup>Rome attracted many immigrant painters, mainly Dutch and Flemish (for instance Both, Bril, Brueghel and Honthorst present in our dataset) or French (such as Lorrain, Dughet and Poussin), who were often focused on the minor genres: mainly still lifes and genre paintings for the Dutch and the Flemish and landscapes for the French.

<sup>17</sup>The same emergence of new genres in the Baroque period can only be justified, from a rational point of view, with the new economic recognition that minor genres started to deliver to the painters.

<sup>18</sup>Notice that we are not claiming that each artist was equally good in each genre, because clearly there could be different talents and skills in different genres (and specialization could induce improvements in a single genre and not in the others). Our hypothesis is different, and it is that if one could switch between genres, he would do it whenever a painting in a different genre could provide a higher payment. If this was the case, genre differentials should disappear on average whenever painters were able to switch.

2006).<sup>19</sup>

Other sources of price differential that derive from the supply side are painting-specific. The most important is size, which reflects the cost of production, possibly increasing less than proportionally with dimension because of likely scale economies. A second factor is the originality of the work: even if the concept of autography was quite different from our modern understanding (plagiarism was not a legal issue), copies, often done by minor painters, could be regarded as belonging to an inferior genre compared to the original works because they did not require a preliminary creative activity. A third factor is related to price discrimination. As long as painters held some market power associated with the differentiation of their styles within the profession, they could adopt basic forms of price discrimination toward the patrons: the main one was given by quantity discounts for multiple commissions, which were quite typical at the time in all kinds of genres.

The technique adopted could substantially affect costs of production and prices: compared to oil paintings, frescoes required a complex preparation (think of ceilings and cupolas, or even large walls) but also a rapid execution, which could have an ambiguous impact on costs.<sup>20</sup> Beyond the different costs of production, frescoes, which were typical of both figurative paintings and landscape paintings, provided a different esthetic perception (and commitment due to the fixed position) within churches and private residences and, therefore, they could command different prices. Whether frescoes were paid more or less than oil paintings remains an open question to be settled at the empirical level. Finally, in case of oil paintings, the support could also affect prices: most oil paintings were executed on canvas, but few others of small size were executed on copper support or other smooth material (typical of still lifes and landscapes).

### 3.2 Price determinants: the demand-side

If we move to analyze the demand side, we expect that different patrons could have different willingness to pay. Our dataset is rich of information that is useful to identify the patrons (mainly noble and rich families, foreign kings, churches and other religious institutions) and the purpose of their commissions (private collections and residences, churches and private chapels

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<sup>19</sup>Specifically, artist effects are associated with the “reputation” of the artists in the art history literature (Spear and Sohm, 2010). This is exactly what we capture with the fixed effects in the econometric analysis. We are thankful to Richard Spear for enlightening comments on this point.

<sup>20</sup>As Spears (2010) notices, “[m]ore data are required before it can be said if it definitely was cheaper to paint in fresco than oil, not only because there were so many variables in the quality and quantities of pigments used in different jobs, but also because a fresco painter might or might not have been responsible for the cost of preparing a wall, or an oil painter for buying his canvases and stretcher. I suspect that generally fresco was the cheaper medium by measure, but even so that does not take into account the overhead of hiring more assistants for elaborate projects” (pp. 56-7).

within the churches). This allows us to test for the existence of various incentive mechanisms typical of labor contracts in the presence of imperfect observability of workers' effort and quality. First of all, some patrons could have higher interest in promoting effort and quality. Since the reservation price of painters was increasing in their ability (for instance because better painters had more outside options), patrons could pay more in order to attract the best painters and avoid adverse selection (Weiss, 1980). Moreover, in the spirit of an efficiency wage mechanism *à la* Shapiro and Stiglitz (1984), we expect that the most susceptible-to-quality patrons were more prone to provide monetary incentives to induce effort of the painters against the risk of working for ordinary patrons.

Different locations for the commissions could generate different willingness to pay and consequently different incentive mechanisms to induce effort and quality. In particular, commissions for private chapels within churches could guarantee high visibility to their patrons in front of the fellow citizens, of the political and ecclesiastic power (and even of God) and signal what at the time was called "magnificence." In this sense we can test a recent theory of signalling *à la* Spence (1973) applied by Nelson and Zeckhauser (2008) to the signalling mechanism present in old artistic commissions. According to the Nelson-Zeckhauser hypothesis, we expect stronger incentive mechanisms to induce quality and thus higher prices for paintings addressed to family chapels, that is private chapels placed inside public churches, compared to common religious commissions and especially compared to other private commissions which were not necessarily destined to public display (private palaces and collections).

Other specific incentive mechanisms can characterize commissions for figurative paintings. One emerges if we look at the patron-artist relationship from the perspective of principal-agent contracts chosen to maximize the payoff of the patrons taking into account the incentives of the artists in exerting effort.<sup>21</sup> In general, the benefits of the patrons were positively related to the quality of the artworks. Since the latter was not directly negotiable (and verifiable), moral hazard was likely to be a relevant issue. Thus, in line with the "informativeness principle" first stated by Holmstrom (1979), it is reasonable to believe that the optimal patron-artist contracts had to be based, explicitly or implicitly, on any verifiable and measurable feature of the painting that was correlated with effort and quality. The number of figures could be taken as a proxy for effort and quality for two main reasons. First of all, the variety and complexity of the composition of human figures invented by the artist had a positive, though partial, correlation with quality, and could be summarized exactly by the number of figures. For instance we know that pricing by number of figures became a typical procedure during the early 600s for leading

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<sup>21</sup>The patrons' payoff could be seen as the difference between the benefits obtained with the commissions and the price paid to the artists.

painters such as Guercino, Domenichino and Guido Reni.<sup>22</sup> Then, the same hierarchy of genres provided a link between number of figures and quality: a higher number of human figures was increasing on average the space destined in the painting to subjects of higher perceived value (the human figures) and reducing the space available for subjects of lower quality (background landscapes or decorative still lifes).<sup>23</sup>

In conclusion, our hypothesis of price equalization between genres should strictly hold between still lifes, genre paintings, landscapes, portraits and all the figurative paintings with a small number of human figures, allowing for increasing price premia when the figurative paintings contained a higher number of figures. To be as conservative as possible, we will define figurative paintings with a small number of figures as those with at most four human figures, and verify their price differential with respect to the other genres. Finally, for a given number of figures we also expect similar prices for figurative paintings of different subject such as religious subject, historical/literary subject, mythological/allegorical subject and battles.

Finally, we test whether arbitrage was also taking place across geographical market. More specifically, we expect that prices for paintings destined to Rome, which was the leading artistic and economic city in Italy, should not be significantly different from prices of paintings destined to minor towns, to the countryside in Italy and even of exported paintings, otherwise profitable opportunities for painters would have emerged. This goes against the common perception at the time, since larger and wealthier art centers as Rome and foreign capitals were regarded as better paying compared to minor destinations (Spear and Sohm, 2010).<sup>24</sup> From an economic point of view, however, we do not expect price differentials to persist after controlling for supply and demand factors.

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<sup>22</sup>Guercino claimed to commit to a fixed price of 100 scudi per full-length figure (50 for half-length figure, 25 for heads); however, this could be part of a sophisticated bargaining technique because deviations from this “commitment” were the rule rather than the exception. In a letter of 1628, Guido Reni argued that the low level painters could not obtain more than 2 or 3 scudi for large life-size figures and ordinary painters could ask at most 15 scudi per figure, while an extraordinary painter like himself could name his own price on the basis of the quality of his work independently from size and number of figures (Spear and Sohm, 2010).

<sup>23</sup>Moreover, painters were often focusing their own effort on human figures and especially on difficult parts as the heads, delegating less relevant parts (including background decorations, landscapes and still lifes) to their own assistants. Accordingly, a higher number of figures was a proxy for a wider direct intervention of the painters in the overall execution, and consequently for higher quality.

<sup>24</sup>In 1625, Fra Atansio, an art dealer who was negotiating an altarpiece by Giovanni Battista Crespi called Cerano in Milan, told the patron that the painter would have probably accepted 250 scudi, but also that if Cerano were to go to Rome he would be paid double because, he added, Rome is “where you go to get rich” (Spear and Sohm, 2010, p. 233).

## 4 Data

In this and the next section we carry out an empirical analysis in order to test our main hypothesis and the collateral predictions. In Section 4.1 we provide an accurate description of the dataset and of the variables we consider as price determinants in the empirical analysis. Section 4.2 shows some descriptive statistics.

### 4.1 Description of the dataset

The econometric analysis is based on a unique dataset established at the Getty Research Institute (the *Payments to Artists Database*, hereafter PAD) which documents payments directly made to artists for the primary market in XVII century Rome (Spear and Sohm, 2010). The dataset contains approximately a thousand records of payments to artists taking place in Rome between 1576 and 1711 and provides a lot of precious information regarding paintings' and painters' characteristics. To the aim of our analysis, the most valuable characteristic of the PAD is that it is a panel matched employer-employee (patron-painter) dataset.

The source of the information includes original contracts between artists and patrons (typically for the altarpieces),<sup>25</sup> records of the buyers themselves (typically for the minor genres, which were not contracted in detail), evidence from contemporary writers, archives and inventories. The survival of all this information for these painters and patrons through centuries is random, but it is quite reasonable that most of the information actually concerns well known painters dealing with famous and wealthy patrons. Therefore, we need to be aware that this selection excludes from the analysis the lower end of the art market, which was populated by largely undistinguished craftsmen supplying low quality products without any formal agreement with the buyers. On the other hand, such selection allows us to focus on the upper end of the art market where the most famous painters were directly competing with each other.<sup>26</sup>

In PAD, the information of a typical “arrangement” between the artist and the patron concerns the record's number, the artist's name, the title, the subject, the object, the dimension, the number of figures, the patron's name, the payment date, the price paid and the destination (both the original and the current one). Finally, the records often contain interesting notes

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<sup>25</sup>See Cavazzini (2010) on the frequency of written contracts during the XVII century in Rome.

<sup>26</sup>The dataset presents quite a few missing values, which in fact markedly reduced the total number of available observations. More specifically, we decided to delete all the records containing simultaneous missing information on the subject (or genre), title and dimension. However, in order to obtain a number of observations as large as possible we decided to make a few guesses regarding the missing values of a given variable, provided that all the other crucial information was certain. All these guesses are described more precisely in an Appendix which will be available on request.

providing further details on the contract, when available. Table 1 describes the structure of the typical arrangement in PAD.

#### INSERT TABLE 1

The original records in the dataset could refer either to a single or to a multiple commission (i.e., more than one painting for the same artist-patron contract). When multiple commissions are taken into account, the total number of single observations increases to about a thousand and five hundred observations. Whether a painting belongs to a single or to a multiple commission is generally explicitly indicated in its title. Knowing the number of paintings for each commission enable us to control for a possible discount premium. The painting’s title also reports whether each painting represents a copy rather than an original work.

The painting’s price is the dependent variable of our econometric analysis. The value given is the amount paid to the artist in silver *scudi romani*; in some cases prices were converted from another currency (such as doubloons, gold *scudi*, *livres tournois*, spanish real and pound sterling).<sup>27</sup> In the rare cases in which prices do not represent an original payment to an artist they are identified as evaluation prices or sale prices. In these cases, however, prices are restricted to the years when the artist was selling his works because they are probably more representative of a painting’s value than after his death.<sup>28</sup> It should be borne in mind that many payments were made in kind (with wine, wheat, cheese, diamonds, even flowers and marzipan): typically their equivalent cash value was cited in the documents and reported in PAD.

In PAD, the “subject” is identified as: sacred, mythological, allegorical, history, heraldic, literary, battle, landscape, architectural, portrait, genre, still life or animals. In order to obtain variables with an easier interpretation and to link them with the traditional artistic subject classification, we aggregated more homogeneous genres among themselves. As a result we obtained the following classification: 1) *Sacred*, 2) *Myth* (mythological and allegory), 3) *History* (history, literary and heraldic), 4) *Battle*, 5) *Landscape* (landscape and architectural), 6) *Portrait*, 7) *Genre*, 8) *Still life* (still life and animal). We defined the first four groups as belonging to the “figurative” genre, as they involved traditional compositions of idealized human figures. The number of figures is also given for the figurative paintings: the full-figure equivalent is reported as a specific number only when the number of figures is lower than five, while full-figure equivalents are more generally designated “5-10” when they vary between five and ten and “crowd” when they are greater than ten or impossible to count.<sup>29</sup>

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<sup>27</sup>The main source for prices conversion is Martini (1983).

<sup>28</sup>Since most artists in PTAD (with the notable exception of Artemisia Gentileschi) are male we will use the male pronoun throughout all this work.

<sup>29</sup>In PTAD, data were assembled with the method for figure counting used by the Deputies of the Cappella del

In the dataset, the “object” refers to both the technique and the support used by the artist. The former includes drawings, etching, fresco, mosaic, oil, tapestry, tempera, watercolor; the latter includes canvas, copper, mirror, lapis, panel, slate, stucco and touchstone. The object also indicates whether a painting was “Easel”, which is used to designate what might also be called a gallery picture and which could be taken as an indirect information for its relatively small size when effective size is missing in the dataset. To guarantee a basic homogeneity in the objects under investigation, we dropped the observations when the object referred to drawings, mosaics, tapestries, and watercolors. We do have a few observations for oil paintings with a support different from canvas and characterized by a smooth and compact surface (mostly copper, but also mirror, lapis, wood panel, and others). As a control for the paintings’s features we included dummies for oil paintings not on canvas and for frescoes. The dimension has been converted in square meters. In some cases the available information is only about one side of the paintings and some other times only the information “small”, “medium”, “large” or only the size of the frame are given. In all these circumstances an appropriate estimate was made (sometimes considering the distribution of size of comparable subjects in the sample).

The artist’s name could either be the name of a single artist or of more artists, that we considered as co-painters. The artist’s name allows us both to control for her talent (by including artist fixed-effects) and also to discriminate among painters according to their origin (local or immigrant). Moreover, since the payment date is reported in the dataset, by looking at the painters’ biographies we derived the age of the painters at the time in which the artwork was made.

As demand factors are concerned, in most cases we have information on the patron’s name, which indicates the person or the institution that commissioned the painting. Patrons could be churches, other religious institutions (e.g., confraternity or religious orders), the papal Basilica of Saint Peter or private patrons. These latter were generally noble families residing in Rome, as in the case of the Barberini or the Chigi family, or in other Italian towns, as for the Gonzaga family in Mantua or the Medici family in Florence. Sometimes even the Popes active during the century directly commissioned paintings. Demand for paintings originated also from foreign patrons, both nobles and kings such as Charles I of England or Louis XIV of France. Finally, paintings were occasionally bought by rich dealers or bankers.

The “destination” in the dataset indicates both the city and the specific location the artwork was addressed to. The majority of paintings was commissioned for the city of Rome. However, the dataset contains many paintings for other important Italian towns, such as Bologna, Flo-

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Tesoro di San Gennaro in Naples in the 1630s. Other than counting what obviously were full or half figures, they counted a certain number of *putti* as the equivalent of a full figure.



rence, Mantua or Naples, for minor provincial centres (such as Ariccia or Viterbo) and also for foreign European destinations, such as London, Madrid or Paris. The variable destination allows us also to distinguish between religious and secular locations. Within religious locations we are able to discriminate between the case in which the painting was placed in a family chapel inside a church or in a public space within the church. Secular locations can be private palaces or private collections. Therefore, overall demand side can be controlled for by patron fixed-effects and by looking both at the city where the paintings was addressed to and at the place where the painting was planned to be positioned. This variable is likely related to the willingness to pay of the patrons. Table A1, in the Appendix, contains the details of the definitions and sources of the variables included in the regressions.

## 4.2 Descriptive statistics of the dataset

The following descriptive analysis is based on the observations remaining after filtering data from missing values and other problems (remaining with 1133 observations). The distribution by genre is shown in Table 2. Notice that the sacred subjects make the largest share of the market, covering almost half of the sample. Altogether figurative paintings (i.e. sacred, battle, historical, and mythological subjects) represent about 60% of the sample. Around 20% are landscapes, while portraits and still lifes cover 9% of the sample each. At last we find genre paintings, with just about 3% of observations.

INSERT TABLE 2

The average price of paintings is 144 scudi, although prices exhibit a large variation, ranging between 1 scudo romano for some still lifes and portraits to the 14,000 scudi of the huge fresco by Gaulli “Triumph of the Name of Jesus” located in the Roman church *Il Gesù*. In spite of few observations with prices above 1,000 scudi, 90% of the paintings are priced less than 300 scudi, while the median value is 48. There are some noticeable differences between the average prices by genre. The highest values are observed for figurative paintings with historical and sacred subjects at the top followed by mythological and allegorical subjects and by battles at the bottom. Landscapes follow next with a value of 66 scudi while portrait, genre paintings and still lifes are the least priced.

The range of variation by dimension is large, with very small paintings measuring less than half square meter up to the majestic “Glorification of the Reign of Pope Urban VIII”, a 363 square meters ceiling fresco by Pietro da Cortona located in Barberini Palace in Rome. However, apart from few very large paintings, the average dimension is slightly more than 5 square meters while the median is just 2 square meters. Considering genres, the data show that the average

dimension is between 1 and 2 square meters for all non-figurative paintings. The average dimension is instead more than 8 square meters in the case of figurative paintings.<sup>30</sup> Popes account for about 5% of the whole demand, while around 8% came from religious institutions (excluding St Peter’s Basilica that alone covers 3.3% of the sample). The paintings were demanded mainly for private locations, particularly private collections (62%). Around one quarter of paintings in the sample was instead addressed to churches, in some cases sponsored by private families for their own chapels inside public churches (6.7%). Demand originated mainly from Rome, but also from other important Italian towns (16%), minor centres in Italy (8%) and others outside Italy (6%) with large price differentials for different destinations. About 6% of the paintings were exported outside Italy.

### INSERT TABLE 3

Turning finally to painters, the dataset contains 113 artists. The mean and median age at which paintings are done is 43 years, almost uniformly distributed among genres. More interesting evidence can actually be obtained if we look at the artists’ specialization by genre in Table 4. While most artists were engaged in multiple or all kind of genres, it is important to verify to what extent this occurs for the works of our dataset. Ignoring the distinction of the figurative genre in its components (sacred, myth, history and battle), we still find 30 artists, namely 27% of the total, that painted works of different genres. For 21 of them (19% of the sample) we observe two genres. All of these painted figurative paintings in addition to another genre. Finally, 9 artists diversified their activity in more than two genres within the dataset. Also in this case all of them painted figurative paintings in addition to two other genres. The remaining artists (83) are specialized in a single genre in the dataset, which in the majority of cases (58) is figurative paintings. Every portraitist in the dataset did paint other genres as well, while the highest specialization is found for still lifes (11 out of 15 artists painting still lifes did not paint other genres in our dataset). Notice that 27 % of artists are multi-genre but this corresponds to approximately half of the total number of observations (since they have more paintings in the dataset on average) and more than half in our empirical analysis (in which we will only focus on painters with at least two observations). Of course, most of the artists may have been engaged in multiple or all genres even if this is not reported in our limited sample. All this strongly supports the fact that painters did diversify their activity.

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<sup>30</sup>When considering figurative paintings, an important attribute to consider is the number of figures depicted. The largest share of paintings (almost 50%) have a low number of figures (from 1 to 4), around one third have an intermediate value (between 5 and 10) while only 17% of figurative paintings contain more than 10 figures.

## 5 Econometric evidence

We estimate a semi-linear price equation where the natural logarithm of price is regressed on a set of dummy variables for genres and on a set of other explanatory variables. Moreover, the PAD has a matched nature as it relates artist and patron information. This allows us to estimate the price equation including both painter and patron fixed-effects and hence to evaluate the extent to which price heterogeneity is related to unobservable characteristics among painters (artist effect) or among patrons (patron effect). Indeed, unobservable ability is in general a crucial factor of wage determination. This is all the more so in the labor market for artists, where the aesthetic value of the artwork, mainly dependent on painter’s talent, is one of the key determinant of its price.

However, in order to include both artists and patrons fixed effects we lost from the sample all the artists and patrons with a single observation, reducing the number of observations from 1133 to 1061. Our sample then comprises a maximum of 1061 paintings for 87 artists and 50 patrons (which reduces in number depending on the explanatory variables we include due to missing values). We should add that our panel of artists and patrons (over paintings) is strongly unbalanced as it includes artists with a minimum of 2 observations and a maximum of 43 observations (Poussin) and patrons with a minimum of 2 to a maximum of 115 observations (the Chigi family).

The payment date in PAD is recorded between 1576 and 1711. In our analysis, however, we slightly reduced the available observations, focusing only on the XVII century, for artistic homogeneity (this is commonly studied as the Baroque period in art history) and also for monetary reasons: the real value of the Roman *scudo* is known to have been stable during that period (see Spear and Sohm, 2010), which allows us to focus on the nominal prices in silver coins without loss of generality.

In such a framework, an OLS fixed effect estimator is the natural candidate for estimating the (log) price of paintings commissioned to an artist  $i$  by a patron  $j$ , using a set of explanatory variables (i.e., paintings and artists characteristics) and including both artist and patron fixed effects. Specifically, we test the following price equation:

$$p_{in} = \alpha + \beta X_{in} + \theta_i + \psi_{j(i,n)} + \chi_{k(j(i,n))} + \varepsilon_{in}$$

in which  $p_{in}$  is the logarithm of the price paid to an artist  $i$  for a painting  $n$ ,  $\alpha$  is a constant,  $X_{in}$  is a vector of painting-varying exogenous characteristics of both artists and of paintings (per artist) with coefficient  $\beta$ ,  $\theta_i$  is the pure artist effect,  $\psi_{j(i,n)}$  is the pure patron effect for the

patron  $j(i, n)$  which has commissioned the painting  $n$  to the artist  $i$ ,  $\chi_{k(j(i, n))}$  is the effect of the genre  $k(j(i, n))$  - which is related to the painting  $n$  which is commissioned to an artist  $i$  by a patron  $j$ , and  $\varepsilon_{in}$  is the statistical residual.

The price equation could also be interpreted as a wage equation in which  $p_{in}$  is the compensation of a worker  $i$  for a painting  $n$ , which is regressed on a set of observable characteristics of the painting and of the workers (experience and origin), on the identity of the individual and on the identity of the “employing” firm. The genre to which each painting belongs could also be interpreted as the “industry” to which each artist belongs. This enables us to interpret mobility of artists across artistic sectors as an inter-industry workers mobility and prices differentials across genres as inter-industry wage (compensation) differentials. One important difference, however, is that while each firm could be classified into a single industry, here each patron (firm) could commission paintings belonging to different genres (industries).

## 5.1 Results

In the first column of Table 4, we start by estimating a baseline price equation where the natural logarithm of price is regressed on dummies for genres in order to highlight the unconditional price differential between them. As already shown by descriptive evidence, a sharp ranking of prices can be detected, with still lifes (the reference category) at the bottom, followed in increasing order by portraits and genre paintings, and by landscapes and battles. Figurative paintings are the best paid artworks, with sacred and mythological subjects with a large number of human figures at the top. We also performed pairwise  $t$  test on the equality of coefficients between still lifes, portraits, genre paintings, landscapes and figurative paintings and we found that they were all statistically different from each other with the only exception of the coefficients of genre paintings and portraits. This result is in line with the traditional hierarchy of genres and with the anecdotal evidence according to which the position of portraits in this hierarchy was variable. Incidentally, this result is also consistent with the descriptive evidence reported in Table 2, where slightly increasing the number of observations is enough to invert the rank between genre and portrait with respect to the one emerging from the baseline regression.<sup>31</sup>

The descriptive analysis has shown a large variation of paintings’ size by subject. More specifically, figurative paintings have a higher average dimension than other subject paintings. Related studies on the value of old master paintings show that dimension was a crucial determinant of prices (see Etro and Pagani, 2012). Hence, we firstly want to see whether the

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<sup>31</sup>Notice that historical subjects and battles appear to be less paid than other figurative subjects, at least in compositions with a large number of figures. This is in line with the hierarchy of genres, since idealized subjects (as religious and mythological subjects) were better considered than realistic (historical) ones.

price differential between genres persists after controlling for paintings' dimension. The second column shows that indeed it does, confirming the price differential between genres per square meter, though the relative price premium diminishes for figurative paintings with a large number of figures.

INSERT TABLE 4

As the following step, in the third column, we control for the full set of paintings' characteristics. Results show that the price differential still exist, although it is reduced: paintings with the same objective characteristics are differently paid depending on the subject they represent, again with still lifes at the bottom and figurative paintings at the top. Prices decrease with the number of commissioned paintings and in the case of oil paintings that are not painted on canvases, even though only at the 10% level of significance; the coefficients for the dummies for copies and frescoes are negative as well. To control for demand effects, in this specification we also include the geographical destination for which the painting was demanded and the location where it was planned to be positioned. Quite interestingly, and in line with the common perception at the time, paintings addressed abroad were the most paid, about 120% more than our reference destination, which is Rome, while paintings commissioned by a minor centre were paid about 50% less. As the location destination is concerned, we can detect a clear ranking where commissions for private chapels were by far the best paid, those for churches were "intermediate", and those for private palaces and private collections (the reference category) were at the bottom. Finally, in this specification we introduce two macroeconomic explanatory variables. The first is the time trend in paintings' prices, which emphasizes a negative but extremely small trend.<sup>32</sup> The second is a dummy for the decade following the plague of 1656, which is meant to capture the effect of the main aggregate shock which may have affected demand (but also supply) during the century: the effect is not significant. Both these controls will be omitted in the following specifications, because of multicollinearity of the time trend with the age of the artists and of the irrelevance of the aggregate shock.

We then add in the fourth column the artist observable characteristics, including the age of the artists and a dummy for the immigrant painters. The price of paintings increases with artist's age by around 2% per year, in line with what found by Etro and Pagani (2012) on a different sample in the same period. Concerning the provenance of the painters, notice that foreign painters were mainly specialized in minor genres, which were less paid in absolute terms. However, when controlling for genres, we do not find any evidence of price differentials between

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<sup>32</sup>Indeed estimating a simple regression of prices over time we can actually detect a slow increase in prices up to the mid of the century (around 1660). After then and up to end of the century, prices slowly decrease. However, such effect is not captured as significant by inserting a squared trend in this specification.

Italian and foreign painters.<sup>33</sup>

In the fifth column we replicate this specification by simply adding patron fixed effects in order to control for unobservable heterogeneity on the demand side. Results show that the price differential between genres still persists, although it is slightly reduced: each patron did pay on average much more for a figurative painting compared to another painting of the same size and characteristics but of a different genre, exactly because the willingness to pay for different genres was variable according to the hierarchy of preferences for different genres in the Baroque age. Notice, however, that after controlling for patron fixed effects the coefficients of the geographical destinations become non-significant at conventional levels, suggesting the existence of an arbitrage mechanism between destinations with different demand (as already pointed out in Etro and Pagani, 2012). Moreover, we can detect a strong increase in the value of the R squared which goes from 0.648 to 0.765 (as a matter of fact, the value of the R squared is constantly increasing throughout the different specifications presented in Table 4).

Including only artist fixed effects, in the sixth column, strongly reduces the price differentials between genres and those coefficients became almost all insignificant, with the exception of all the coefficients of figurative paintings. We should emphasize that the value of the R squared is higher in this specification which contains only artist fixed effects (i.e., 0.795) with respect to the previous one where we included only patron fixed effects. This evidence suggests that artist effect are more important than patron effect to explain price variation.

Estimation results of the full model of our price equation are presented in the last column of Table 4. This specification includes both patrons and artists fixed-effect (i.e., their unobservable characteristics to control for individual talent). The price differential between still lifes and all the other genres finally disappears: *ceteris paribus*, a still life was not paid differently from a portrait, a genre painting, a landscape or a figurative painting (with less than five figures) by the same painter. Moreover, notice that also any price differential between figurative paintings (namely of historical, mythological and sacred subject) with a similar number of figures disappears. This is true for all the three groups of figurative paintings, that is with less than five figures, with five to ten figures and with a crowd or more than ten figures (which includes also all the battles). Therefore, our main hypothesis is fully confirmed: the artistic sector choice of painters led to the equalization of prices. In a sense, if figurative paintings were paid more in absolute terms, it was mainly because better painters were engaged in figurative paintings. On the other side, minor painters could not switch from still lifes to figurative paintings to earn extra profits because they would have been paid less than other painters, exactly enough to make

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<sup>33</sup>Results will not be displayed in the full specification due to collinearity with the artists fixed effects.

them indifferent between genres. Which is exactly what a competitive labour market would have predicted. Exploiting the analogy between industries and genres we can conclude that this result is in line with that of AKM who show that most of the inter-industry wage differential is explained by the variation in the average individual heterogeneity across sectors.<sup>34</sup>

Moreover, at this stage of the analysis we can comment also on the other final estimation results. Starting from the effect of paintings' characteristics, we confirm previous results regarding the positive link between size and price, with a return above 3% per square meter; moreover, we find evidence of decreasing returns given the negative and significant coefficient of the squared term. The price premium for figurative paintings with a large number of human figures remains and it is statistically significant: plus 90% for figurative paintings with five to ten figure and plus 120% for those with more than ten figures.<sup>35</sup> This is consistent with our hypothesis that quantifiable aspects of paintings as the number of figures depicted were agreed (in preliminary drawings or verbal communications, as we know it happened for Guercino, Guido Reni and others) also with the purpose of insuring a certain effort and quality, a sort of incentive mechanism to limit moral hazard in line with standard principal-agent theory.

The dummy on frescoes is negative and significant: this suggests that the rapid technique of frescoes, often executed by high quality painters, was compensated with a lower payment per square meter. Nevertheless, in the absence of further information on the time of execution of frescoes, as compared to oil paintings, we cannot draw definitive conclusions on the existence of price differentials between the two techniques. The coefficients for copies and for paintings not on canvas are negative and significant in specifications not controlling for artists' characteristics, while in the full specification they remain negative but they turn insignificant. Therefore, copies (or replicas of existing paintings) and paintings on copper and other unusual supports were not paid less, but they were simply done by worse painters. There was nothing to gain in specializing in copies or in paintings on a different support, otherwise a profitable opportunity would have emerged. Finally, the negative coefficient of the variable describing the number of paintings in the multiple commissions highlights the existence of a quantity discount of around 5% for each additional painting.

As to demand factors, in the first place it can be noticed that destinations' coefficients are non-significant and, recalling that Rome is the excluded category, this result highlights that

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<sup>34</sup>After controlling for patrons fixed effects, in the fourth column, the compensation differential across genres were actually reduced but person effects and not firm effects form the basis here for most of the inter-industry salary structure (as in AKM).

<sup>35</sup>Notice that the price premium for figurative paintings with a small number of figures becomes not only statistically insignificant, but also economically insignificant when we limit the category to a lower number of figures (up to two or three). Incidentally, this would be the most proper comparison with portraits that are almost always confined to a single figure.

prices of artworks produced for destinations different from Rome were not different, *ceteris paribus*, from prices of equivalent paintings addressed to other places, including foreign destinations. Moreover, tests on the equality of coefficients between all destinations' pairs show that they were not statistically different from each other. This suggests that high demand cities did not pay more but simply attracted better painters or demanded paintings by the most talented artists: arbitrage took place both across sectors (genres) and across geographical markets.

Interesting results concern the impact of the place where the artwork was addressed to. As a matter of fact, the same patron could have different willingness to pay depending on the place where the painting was planned to be positioned. For instance, patrons often commissioned paintings for their private chapels within public churches. Obviously these paintings were visible to all the people attending the church and it was clear that the paintings located in these private chapels had been financed by the family to which the chapel was named after. Hence, we expect that patrons had a particularly high willingness to pay to induce effort by the artists and obtain high quality in these works compared to those for private palaces and collections. Our estimates largely confirm this hypothesis: the very high and significant coefficient for the commissions for private chapels implies that they were on average more paid than paintings for private collections (the excluded category) and private palaces; however, the coefficient of private chapel is higher but not significantly different from that of other religious destinations.

INSERT TABLE 4 (cont'd) (patron)

As expected, patrons' characteristics also affect prices. Due to the unbalanced nature of our panel, in Table 4, we report only the coefficients of the patrons with at least eight observations, since for too few observations it would be difficult to comment on the values of their coefficients. The reference group is the patron who was paying less, the Sacchetti family (whose average price was 6 scudi), and so the coefficient of each patron should be interpreted with respect to Sacchetti. The patrons who were paying more were, by far, the Gonzaga and the Medici family, foreign kings and the Saint Peter's church with a premium of about 300% compared to the reference group. Then we find the most important Roman families, such as Barberini, Borghese, Chigi and Colonna, the popes and all the religious commissions and foreign nobles who were paying a premium of about 200%.

Interpreting these results from a labor market perspective, however, is not obvious for many reasons and our data do not allow us to disentangle among possible different explanations. First of all, the demand for paintings expressed by the patrons (contrary to firms) is a demand for consumption and not for production and so, in our setting, an explanation for the existence of a price difference at the employer level, may depend on some limited capacity at the patron



level.<sup>36</sup> Moreover, it could also be the case that working for some specific patrons provided to artists alternative types of compensation (i.e., compensating wage differentials) such as the opportunity to access to prestigious networks and so to see an increase in their future earning profile.<sup>37</sup> Beyond this, however, we believe that the most convincing explanation of the results on the patrons' coefficients is in terms of efficiency wage mechanisms aimed either at increasing artists' effort (Shapiro and Stiglitz, 1984) or at selecting better painters (Weiss, 1980). In the case of Saint Peter and foreign kings, for example, we expect that the motivation to obtain high-quality artworks was higher than average and also coupled with a larger amount of economic resources to allocate to art. Then, in order to obtain more effort, these patrons were most likely to be willing to pay more than ordinary patrons. The same could hold for selected leading families, while minor families and other patrons were paying ordinary wages so as to create a sort of artistic duality in this labor market.

INSERT TABLE 4 (cont'd) (artist)

Finally, let us move to the painters' characteristics. The price of paintings increases with artist's age by around 2% per year which may be related to the importance of experience or to some reputational mechanism. As we did for patrons, in Table 5 we also report the coefficients of the artists with at least eight observations in the estimation sample.<sup>38</sup> Results show that some of the most famous painters of the time were the best paid: first of all the main masters of the typical Baroque art as Carlo Maratta, Pietro da Cortona and Guido Reni, mainly engaged in figurative paintings, but also painters active in multiple genres such as Caravaggio, who is actually responsible for the introduction of genre paintings and still lifes in Rome, and the French painter Simon Vouet. Between the best paid painters we also find two other French painters, Nicolas Poussin and Claude Lorrain, who were mainly engaged in landscape paintings.<sup>39</sup>

## 5.2 Robustness checks

As a robustness check, in Table 5 we present the results of a regression in which we limited the data to the paintings of the "switchers", that is the painters that in the dataset have paintings

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<sup>36</sup>Nevertheless, paintings at that time should not be classified strictly as consumer durable goods but they were also a signal of the patron's status (power). To some extent, religious paintings also represented a form of intertemporal substitution between present and future consumption (if we interpret them as a tribute to God and thus as an instrument to gain access to perpetual life).

<sup>37</sup>That would explain, for example, why a minor family as the Nolfi was paying more than the Barberini or the Chigi families.

<sup>38</sup>The artist fixed effects are estimated in Stata using the command *fese* (Austin, 2008), which was created specifically to estimate fixed effects and their standard errors building on the *areg* procedure. Note that *areg* is always equivalent to running regress with an exhaustive set of indicator variables for panels.

<sup>39</sup>Notice that even painters who were often engaged in battles (Salvator Rosa) and portraits (Leoni) are well ranked after controlling for all the paintings' and patrons' features.

in more than one genre.<sup>40</sup> In fact, if all artists were strictly specialized in a single genre, by simply adding a dummy for each artist to the dummies for genres would explain why the inter-genre price differential goes away. To the contrary, the main assumption underlying our result is that the painters, or some of them, could switch their activity between different genres to exploit any profitable opportunities, which implies that such opportunities should disappear in equilibrium. An immediate implication of this is that price equalization should strictly hold for all the painters that do diversify within our dataset: we can verify this by restricting the empirical analysis to the painters that have actually switched between more than one genre within our dataset. The results presented in Table 5 reinforce our main conclusion regarding the validity of the price equalization between genres hypothesis.<sup>41</sup>

INSERT TABLE 5

Finally, in Table A2, in the Appendix, we show the results of three specifications which are meant to show the different role of genres, patrons and artists in explaining price variation of paintings. More specifically, we have regressed the (log) price of paintings over all the paintings and artist characteristics and, one at a time, we have included genres, patrons and painters. The value of the R squared is the highest in the column which contains the artist fixed effects (third column in Table A2). This is in line with what previously found by AKM in a different context, namely that artist effects are more important than patron and genre effects to explain price variation of paintings.

## 6 Conclusions

We analyzed the labor market in the Baroque Roman art sector using a unique matched painter-patron panel dataset on commissions for still lifes, landscapes, portraits, genre paintings, battles and sacred, mythological and historical paintings. In line with the traditional hierarchy of genres, price differential between them was high and significant. Adopting a labor economics perspective we were able to analyze the inter-industry (genre) compensation differentials taking into account the role of individual and employer heterogeneity in the determination of workers' compensation. We found that most of the inter-genre price differential is explained by the variation in average individual heterogeneity across sectors (genres). This suggests that the labor market for painters was rather competitive at the industry level and allocated artists between

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<sup>40</sup>Table 3 shows that, in the dataset, the paintings of the artists belonging to more than one genre cover about half of all the paintings.

<sup>41</sup>Incidentally, we know that most of the painters who have a single genre in the dataset did paint also other genres (not in the dataset), therefore the set of the “switchers” is in principle larger than the one we have, it is then remarkable that our conclusions are confirmed.

artistic genres to the point of equalizing the marginal return of different genres. For each painter, every commission from a patron for a still life, a portrait, a genre painting, a landscape or a comparable figurative painting was equally profitable at the margin. This reflected an efficient equilibrium of occupational choice and, incidentally, made it possible for the new artistic genres to develop and flourish in this and the following centuries.

Future research could analyze data from the earlier Italian art market, namely Renaissance, and from the contemporary Dutch and Flemish market. The former is interesting for the analysis of the figurative paintings, to verify whether the trends emphasized here for the Baroque age are common to the earlier period. The latter is interesting for analyzing price differentials between artistic sectors in a different context.<sup>42</sup> A look at the commissions for sculptures or other artistic products for which data are available could also be fruitful to confirm some of our insights.

Finally, in a Schumpeterian perspective, it would be interesting to investigate whether different compensations affected artistic innovations in certain locations or certain periods of art history: it was not by chance that artistic innovation flourished first in the wealthiest cities characterized by more developed free market economies, as the one examined here.

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<sup>42</sup>Casual evidence suggests that not only relative convergence of prices took place in the Dutch golden age, but also absolute convergence occurred. This should not be surprising since top quality painters started working in every single genre (for instance Heda in still lifes, Hals in portraits, Vermeer in genre paintings, van Ruisdael in landscapes and Rembrandt in figurative paintings).

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**Table 1: typical record in PTAD**

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PI Record	No.P-264
Artist Name	CARAVAGGIO, MICHELANGELO MERISI DA
Title	Martyrdom of St. Matthew; Calling St. Matthew
Subject	Sacred
Object Type	Oil (chapel laterals)
Dimensions	322 x 343 cm; 323 x 340 cm
Figures	5-10; crowd
Patron Name	Estate of Cointrel, Mathieu, Cardinal
Payment Date	1599-1600
Price Paid	400 scudi for two paintings
City (Destination)	Rome, S. Luigi dei Francesi, Contarelli chapel

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**Table 2: Descriptive Statistics of the original Dataset (1133 obs)**

Genre distribution (%)							
Still	Portrait	Genre	Landscape	Battle	Myth	Sacred	History
9	9	3	21	3	7	45	3
Average price by genre (in scudi romani)							
Still	Portrait	Genre	Landscape	Battle	Myth	Sacred	History
17	39	25	66	73	202	242	262
Average size by genre (in square meters)							
Still	Portrait	Genre	Landscape	Battle	Myth	Sacred	History
1.1	1.9	1.4	1.9	1.5	15.3	7.3	11.5
Number of figures distribution (%)							
Low (1-4)	Medium (5-10)				High (crowd)		
49	33				17		
Object type distribution (%)							
Not on canvas support	Fresco				Copy		
6	7				3		
Patrons (%)							
Rel other	King	Foreign noble	St Peter	Pope	Church	Private families	
0.7	1	2	3.3	5	7	81	
Location Destination (%)							
Private chapel	Private palace			Church		Private collection	
6.7	12			19		62	
City destination (%)							
Foreign	Rome			Medium		Minor	
6	70			16		8	
Average price by destination (in scudi romani)							
Foreign	Rome			Medium		Minor	
238	146			137		127	



**Table 3: Artist Specialization by Genre**

	Number of genres			
	1	2	3	Total
No. of artist	83	21	9	113
of which:				
Stilllife	11	1	3	15
Genre	3	2	4	9
Landscape	11	5	6	22
Portrait	0	13	5	18
Figurative	58	21	9	88
% observations	53	26	21	100

**Table 4: Log Price determination**

	Baseline	Baseline	With paintings	With artist	With only	With only	With patron
	with size	with size	characterstics	characterstics	patron FE	artist FE	& artist FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Still life (omitted)</b>							
<b>Portrait</b>	0.631*** (4.099)	0.592*** (3.894)	0.530*** (3.745)	0.726*** (4.995)	0.596*** (3.894)	-0.283 (-0.752)	-0.349 (-0.877)
<b>Genre</b>	0.674*** (3.212)	0.668*** (3.267)	0.591*** (2.924)	0.518** (2.237)	0.437** (1.983)	0.002 (0.00539)	-0.030 (-0.0751)
<b>Landscape</b>	1.383*** (9.643)	1.338*** (9.416)	1.092*** (7.915)	1.098*** (7.255)	0.864*** (4.795)	0.062 (0.156)	0.308 (0.699)
<b>Figurative (&lt; 5 fig)</b>	1.901*** (13.27)	1.770*** (12.17)	1.360*** (8.870)	1.468*** (9.785)	1.268*** (7.378)	0.588* (1.684)	0.534 (1.446)
Sacred < 5 (omitted)							
History < 5	0.090 (0.532)	0.129 (0.888)	0.086 (0.387)	0.011 (0.0463)	0.019 (0.0996)	-0.240 (-0.826)	0.003 (0.00997)
Myth < 5	-0.211 (-1.292)	-0.193 (-1.231)	0.040 (0.211)	-0.020 (-0.105)	0.072 (0.370)	-0.018 (-0.0933)	0.100 (0.488)
<b>Figurative (5-10 fig)</b>	2.886*** (19.53)	2.572*** (17.31)	1.934*** (12.23)	1.994*** (12.83)	1.636*** (9.227)	1.100*** (3.126)	0.912** (2.457)
Sacred 5-10 (omitted)							
History 5-10	-0.716*** (-3.213)	-0.506** (-2.202)	-0.107 (-0.442)	0.001 (0.00585)	0.009 (0.0395)	-0.111 (-0.620)	0.004 (0.0211)
Myth 5-10	-0.154 (-0.365)	0.011 (0.0264)	-0.010 (-0.0260)	-0.037 (-0.108)	-0.243 (-0.863)	-0.042 (-0.142)	-0.354 (-1.243)
<b>Figurative (&gt;10 fig)</b>	3.439*** (14.10)	2.586*** (10.83)	2.045*** (9.152)	2.304*** (10.53)	1.858*** (8.073)	1.365*** (3.506)	1.183*** (2.811)
Sacred >10 (omitted)							
History >10	-1.192*** (-2.961)	-0.506 (-1.311)	-0.113 (-0.389)	-0.264 (-0.817)	-0.175 (-0.721)	-0.121 (-0.271)	-0.000 (-0.000892)
Myth >10	0.124 (0.353)	-0.249 (-0.792)	0.407 (1.341)	0.173 (0.585)	0.380 (1.140)	0.231 (0.622)	0.413 (1.155)
Battle >10	-2.169*** (-6.207)	-1.334*** (-3.942)	-0.822** (-2.427)	-1.057*** (-3.136)	-0.941*** (-3.730)	-0.123 (-0.340)	-0.282 (-0.837)
<b>Size</b>		0.053*** (5.854)	0.044*** (5.302)	0.039*** (4.615)	0.034*** (4.576)	0.037*** (3.681)	0.032*** (3.153)
<b>Size^2</b>		-0.000*** (-4.557)	-0.000*** (-4.261)	-0.000*** (-3.630)	-0.000*** (-3.427)	-0.000*** (-3.091)	-0.000*** (-2.737)
# commissions			-0.016* (-1.851)	-0.026*** (-3.019)	-0.099*** (-5.318)	0.005 (0.568)	-0.049** (-1.997)
Copy			-0.556** (-2.381)	-0.797*** (-2.869)	-0.996*** (-4.420)	0.024 (0.0851)	-0.177 (-0.799)
Not on canvas			-0.284* (-1.824)	-0.309** (-2.046)	-0.435*** (-2.850)	-0.201 (-0.998)	-0.280 (-1.379)
Fresco			-0.213 (-1.396)	-0.087 (-0.534)	-0.472** (-2.317)	-0.218 (-1.119)	-0.396** (-2.053)
Private chapel			1.517*** (8.396)	1.697*** (9.429)	0.797*** (3.318)	1.112*** (6.589)	0.686** (2.276)
Church and other rel			0.855***	0.851***	0.514***	0.846***	0.645***

			(6.559)	(6.688)	(3.239)	(6.300)	(4.217)
Private palace			0.294**	0.429***	0.287	0.331**	0.557***
			(2.172)	(2.992)	(1.572)	(2.539)	(3.205)
Private collection (omitted)							
Minor destinations			-0.492***	-0.432***	-0.105	-0.151	0.109
			(-3.330)	(-2.920)	(-0.477)	(-0.900)	(0.524)
Medium destinations			0.474***	0.445***	0.215	0.279**	0.023
			(4.329)	(3.998)	(1.033)	(2.425)	(0.140)
Exports			1.163***	0.868***	0.328	0.544***	0.286
			(7.451)	(5.158)	(1.210)	(2.608)	(1.312)
Rome (omitted)							
Age of artist				0.021***	0.018***	0.016***	0.018***
				(6.288)	(5.428)	(3.339)	(3.313)
Immigrant				-0.069	0.117		
				(-0.650)	(0.992)		
Trend			-0.006***				
			(-3.717)				
Plague			0.147				
			(1.366)				
Constant	2.204***	2.145***	12.503***	1.270***	1.136***	-0.142	0.312
	(19.05)	(18.74)	(4.507)	(6.621)	(4.401)	(-0.895)	(0.616)
Observations	867	831	732	732	732	732	732
R-squared	0.419	0.477	0.631	0.648	0.765	0.795	0.852

Robust t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4 (cont'd): Log Price determination**

Patron with at least 8 obs. in the est. sample	With patron & artist FE	Patron (cont'd)	With patron & artist FE
Aldobrandini	1.805*** (4.436)	Ruffo	2.196*** (4.929)
Altemps	1.718** (2.491)	<i>Vatican St. Peter</i>	2.913*** (6.476)
Barberini	1.988*** (4.877)	Valguarnera	2.079*** (4.134)
Borghese	2.125*** (5.057)		
Capocaccia	1.259** (2.482)		
Chigi	2.181*** (5.195)		
<i>Church</i>	2.166*** (4.886)		
Colonna	2.131*** (5.318)		
Filomarino	0.533 (1.012)		
<i>Foreign nobles</i>	2.324*** (5.229)		
Gonzaga	3.777*** (6.170)		
<i>King</i>	3.503*** (6.079)		
Mattei	1.895*** (3.995)		
Mazarin	1.466*** (2.786)		
Medici	2.966*** (5.973)		
Nolfi	3.838*** (7.593)		
Orsini	0.711 (1.303)		
Perettimontalto	2.337*** (4.927)		
Pointel	1.717*** (2.727)		
<i>Pope</i>	1.920*** (4.647)		
Roscioli	1.500*** (3.317)		

Robust t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4 (cont'd) : Log Price determination**

Artists with at least 8 obs. in the est. sample	With patron & artist FE	Artist (cont'd)	With patron & artist FE
Arpino	0.479 (0.777)	Lorrain	1.148** (1.997)
Baglione	0.295 (0.432)	Maratti	1.382** (2.439)
Belloni	-0.631 (-0.957)	Mattia	-0.163 (-0.291)
Both	0.656 (1.140)	Mei	0.637 (1.228)
Bril	-0.282 (-0.437)	Morandi	0.293 (0.512)
Camassei	0.258 (0.416)	Nuzzi	-0.411 (-0.851)
Caravaggio	1.103** (2.018)	Pace	-0.099 (-0.217)
Cerquozzi	0.314 (0.504)	Poussin	0.983* (1.638)
Courtois	-0.399 (-0.672)	Reni	0.962* (1.739)
Cortona	1.171** (2.065)	G. Romanelli	0.672 (1.233)
V. de Boulogne	0.733 (1.278)	Rosa	0.964 (1.376)
Domenichino	0.404 (0.701)	G. Sacchi	0.871 (1.471)
Dughet	-0.222 (-0.360)	Salini	-1.074 (-1.540)
Ferri	0.555 (1.003)	Stanchi	0.466 (0.969)
F. Napoletano	0.324 (0.548)	Tempesta	-0.255 (-0.392)
Gaulli	0.521 (0.994)	Vouet	1.178* (1.708)
Gimignani	-0.004 (-0.006)		
Grimaldi	0.571 (1.070)		
Jannetti	-1.742*** (-2.843)		
Lanfranco	0.785 (1.335)		
Leoni	1.241 (1.591)		

Robust t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5: Log Price determination, multigenre**

	With patron & artist FE only multigenre
<b>Still life (omitted)</b>	
<b>Portrait</b>	-0.100 (-0.222)
<b>Genre</b>	0.266 (0.586)
<b>Landscape</b>	0.536 (1.096)
<b>Figurative (&lt;5 fig)</b>	0.647 (1.430)
Sacred <5 (omitted)	
History <5	-0.512 (-1.152)
Myth <5	0.225 (0.704)
<b>Figurative (5-10 fig)</b>	1.259*** (2.647)
Sacred 5-10 (omitted)	
History 5-10	0.093 (0.275)
Myth 5-10	-0.562 (-1.231)
<b>Figurative (&gt;10 fig)</b>	1.330** (2.489)
Sacred >10 (omitted)	
History >10	-0.122 (-0.160)
Myth >10	0.660 (1.499)
Battle >10	-0.616 (-1.279)
Constant	2.129** (2.473)
Other controls	YES
Observations	359
R-squared	0.858

Robust t-stat. in parentes \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table A1: Variables Definitions**

<b>Variables</b>	<b>Definition</b>
<b>VARIABLES OF INTEREST:</b>	
<b>GENRE and NUMBER of FIGURES</b>	
Still lifes	Dummy =1 for a still life
Landscapes	Dummy =1 for a landscape
Genre paintings	Dummy = 1 for a genre
Portraits	Dummy = 1 for a portrait
<b>Figurative paintings (1-4 fig)</b>	Dummy = 1 for a “figurative painting” (i.e., Sacred or History or Myth) with 1 to 4 fig.
Sacred (1-4 figures)	Interaction Sacred * Figurative (1 to 4 figures)
Historical & Literary (1-4 fig)	Interaction Histoy * Figurative (1 to 4 figures)
Mythological & Allegory (1-4 fig)	Interaction Myth * Figurative (1 to 4 figures)
<b>Figurative paintings (5-10 fig)</b>	Dummy = 1 for a “figurative painting” (i.e., Sacred/History/Myth) with 5 to 10 fig.
Sacred (5-10 fig)	Interaction Sacred * Figurative (5 to 10 figures)
Historical & Literary (5-10 fig)	Interaction Histoy * Figurative (5 to 10 figures)
Mythological & Allegory (5-10 fig)	Interaction Myth * Figurative (5 to 10 figures)
<b>Figurative paintings (&gt;10 fig)</b>	Dummy = 1 for a “figurative painting” (i.e., Sacred/History/Myth) with > 10 fig.
Sacred (>10 fig)	Interaction Sacred * Figurative (> 10 figures)
Historical & Literary (>10 fig)	Interaction Histoy * Figurative (> 10 figures)
Mythological & Allegory (>10 fig)	Interaction Myth * Figurative (> 10 figures)
Battles	Interaction Battle* Figurative (> 10 figures)
<b>CONTROL VARIABLES:</b>	
<b>PAINTINGS CHARACTERISTICS</b>	
Size (square meters)	Size in square meters
Size (square meters) squared	Size in square meters squared
Number of commissioned paintings	Number of paintings for single and multiple commission
Copy from original	Dummy= 1 for a copy form original
Not on canvas	Dummy= 1 for paintings on a support different form canvas (e.g. copper etc)
Fresco	Dummy= 1 for frescos
<b>CITY DESTINATIONS</b>	
Rome	Dummy = 1 for destination Rome
Minor destinations	Dummy = 1 for destination to minor Italian town
Medium destinations	Dummy = 1 for destination to major Italian town
Exports	Dummy = 1 for foreign destination

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**LOCATION DESTINATIONS**

Private palace	Dummy = 1 for destination private palace
Private collection	Dummy = 1 for destination private collection
Private chapel	Dummy = 1 for destination private palace
Church and other religious buildings	Dummy = 1 for destination church and other rel. buildings

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**PATRONS FIXED EFFECTS**

Private families	Dummy = 1 when patrons are private families with at least 2 observations in the sample
Kings' commission	Dummy = 1 when the patron is a king
Foreign nobles	Dummy = 1 when the patron is a foreign noble
Churches	Dummy = 1 when the patrons are urban churches
Vatican St. Peters	Dummy = 1 when the patron is the Vatican St. Peter
Pope's commission	Dummy = 1 when the patron is a Pope
Other religious institutions	Dummy = 1 for other religious commissions

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**ARTISTS CHARACTERISTICS and FIXED EFFECTS**

Artists	Dummy =1 for artists with at least 2 observations
Age of artist	Difference between payment date and year of birth
Immigrant	Dummy =1 for artists coming from outside Italy

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**OTHER**

Time trend	Payment date
Plague	Dummy = 1 for the period 1656 1665 (aggregate demand shocks)

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**Table A1 (cont'd): Variable Definition**

ARTISTS		PRIVATE FAMILIES	DESTINATIONS
Abbatini	Mola	Aldobrandini	<b>MINOR:</b>
Alberti	Morandi	Altemps	Ariccia
Arpino	Nuzzi	Altieri	Bagnaia
Baderni	Pace	Barberini	Bassano di Sutri
Baglione	Passerotti	Borghese	Bassano Romano
Belloni	Pellegrini	Bornia	Caprarola
Bonzi	Perfetta	Borromeo	Castel Gandolfo
Both	Pomarancio	Brancallero	Castel San Pietro
Brandi	Porpora	Campello	Catania
Bril	Poussin	Capocaccia	Cesena
Brueghel	G. Preti	Cardelli	Fano
Camassei	M. Preti	Cerasi	Fara
Caravaggio	Reni	Chigi	Foligno
Caroselli	G. Romanelli	Colonna	Frascati
Carracci	U. Romanelli	Correggio	Lanuvio
Cerquozzi	Rondoni	Corsini	San Quirico d'Orcia
Cerrini	Rosa	de Rossi	Spoletto
Chiari	Sacchi	Farnese	Tivoli
Ciampelli	Salini	Filomarino	
Cigoli	Saraceni	Fugotto	<b>MEDIUM:</b>
Codazzi	Sassoferrato	Giustiniani	Arezzo
Courtois	G. Stanchi	Gonzaga	Ferrara
Cozza	N. Stanchi	Guicciardini	Florence
Cresti	Stella	Mattei	Mantua
Cortona	Stom	Mazarin	Messina
V. de Boulogne	Swanevelt	Medici	Milan
Domenichino	Tanari	Nolfi	Naples
Dughet	Tassi	Orsini	Palermo
Elsheimer	Tempesta	Pamphilj	Perugia
Ferri	Tomasini	Peretti Montalto	Pistoia
F. Napoletano	Trevisani	Pointel	Siena
Galli	Turchi	Riviera	Venice
Gaulli	Vajani	Roscioli	
A. Gentileschi	F. Vanni	Rospigliosi	<b>EXPORTS:</b>
G. Gimignani	R. Vanni	Ruffo	Antwerp
L. Gimignani	Viola	Sacchetti	Austria
Gramatica	Vouet	Santacroce	Dalmazia
Grimaldi		Santori	London
Honthorst		Savoia	Madrid
Jannetti		Sfondrato	Paris
Laer		Spada	Rouen
Lanfranco		Valguarnera	Switzerland
Leoni		Vatican	
Lorrain			
Manfredi			
Manfredi			
Maratti			
Maratti & Onofri			
Mattia			
Mei			
Miel			

**Table A2: Log Price determination, within genres, patrons and artists**

	within genres no patron, no artist	within patrons no genre, no artist	within artist no genre, no patron
	(1)	(2)	(3)
Size	0.039*** (4.615)	0.055*** (5.934)	0.055*** (5.256)
Size^2	-0.000*** (-3.630)	-0.000*** (-4.318)	-0.000*** (-4.253)
# commissions	-0.026*** (-3.019)	-0.156*** (-8.214)	0.001 (0.0756)
Copy	-0.797*** (-2.869)	-0.533* (-1.889)	0.204 (0.793)
Not on canvas	-0.309** (-2.046)	-0.269** (-2.031)	-0.189 (-1.130)
Fresco	-0.087 (-0.534)	-0.481** (-2.163)	-0.245 (-1.244)
Private chapel	1.697*** (9.429)	0.806*** (3.101)	1.553*** (7.937)
Church and other rel	0.851*** (6.688)	0.940*** (5.003)	1.098*** (7.771)
Private palace	0.429*** (2.992)	0.352* (1.859)	0.348*** (2.712)
Private collection (omitted)			
Minor destinations	-0.432*** (-2.920)	-0.176 (-0.698)	-0.196 (-1.199)
Medium destinations	0.445*** (3.998)	0.284 (1.285)	0.342*** (3.046)
Exports	0.868*** (5.158)	0.425 (1.377)	0.605*** (2.608)
Rome (omitted)			
Age of artist	0.021*** (6.288)	0.013*** (4.144)	0.011** (2.381)
Immigrant	-0.069 (-0.650)	0.243** (2.471)	
Constant	1.270*** (6.621)	2.667*** (9.268)	0.039 (0.276)
Observations	732	801	801
R-squared	0.648	0.703	0.760

Robust t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1