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Bargaining over Beauty: The Economics of Contracts in Renaissance Art Markets

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Abstract

We study contracting practices in the market for paintings in Renaissance Italy. Building on insights from the economic analysis of contracts and qualitative analysis of primary sources, we first show that transaction costs threatened the relationship between buyer—the patron—and seller—the painter. We empirically investigate the channels through which transaction costs influenced contracting practices using a novel data set measuring the content and structure of 90 commission documents from the later 13th to the early 16th century. We find strong evidence that patrons used formal contracts to mitigate painters' opportunism but little evidence that artists' age-related reputation for honest dealing had a systematic effect on contracting practices.

1. Introduction

We study the fundamental institution that governed the market for paintings in Renaissance Italy: the commission contract. On the demand side of this market were the patrons: individuals or corporate entities willing to disburse significant sums of money to decorate public spaces and signal their magnificence to the rest of society (Nelson and Zeckhauser 2014). On the supply side were the master painters and their workshops of skilled artisans. When the two sides came together—that is, when the patron awarded a commission to a master painter—they drafted a contract with the aid of a notary. The document was legally binding, listing each party's obligations to the other. The content and structure of the documents varied significantly from contract to contract. Some were quite long, referencing several categories of obligations explicitly and containing detailed descriptions of the final product. Others were relatively short, referencing only a

We thank Alexander Lapuente for translating several Renaissance commission documents from the original Latin. We are indebted Richard Holden and a reviewer for helpful criticism and guidance and to Doug Allen, Art Carden, and Glen Whitman for commenting on a previous draft. We also benefited from feedback from Peter Leeson, Paola Suarez, and participants in research seminars at the University of Mississippi and Creighton University. Gabriel Benzecry and Nicholas Reinhart provided helpful research assistance.

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few of either party's duties and making no effort to describe the subject of the painting. Some texts explicitly relied on formal, third-party enforcement. Others were supported by informal mechanisms. The fundamental contribution of this article is to show how transaction costs influenced the structure and content of Renaissance art contracts.¹

A cursory understanding of the workings of Renaissance art markets is enough to grasp the importance of transaction costs in the primary market for paintings. Artworks often required expensive materials like gold and lapis lazuli, which painters could replace with cheaper options and pocket the difference. Popular painters would often take on too much work at once, which left them with the choice between delegating to their (less talented) assistants or failing to execute commissions by the agreed-on date. Neither option would have been particularly popular with patrons. Given these circumstances, drafting a contract that specified each party's obligations facilitated the transaction. However, the nature of the commodity prevented such contracts from being complete. The cost of drafting a contract (a particular type of transaction cost) is seldom 0, even for commodities much less complex than works of art. In the case of a painting, the subjective nature of its value combined with the inability of the patron to perfectly observe the painter's effort exacerbated the difficulties of drafting a complete contract.

To quantify the effects of transaction costs on contracting practices in Renaissance art markets, we built a novel data set using commission contracts from that period (between 1285 and 1530). We collected documents corresponding to commissions for paintings from Renaissance Italy from a wide array of secondary sources, most notably the list of commission contracts in O'Malley (2005) and those from the Italian Renaissance Document Site at the University of Kent. Our sample consists of 90 documents, each corresponding to a unique painting commission. For each document, we extracted information about its length and the value of the underlying commission. We also used information from the documents to create an index to measure the degree of contractual completeness. The index consists of 10 binary variables, each corresponding to a category of terms and conditions typical of Renaissance art contracts.

We combined these data with commission- and painter-specific information, including the type of painting (an altarpiece, a fresco, or some other medium) and the age of the artist at the time of the commission. We use the resulting data set to test two distinct sets of hypotheses on the effect of transaction costs on contracting practices in Renaissance Italy. The first approach views a formal contract as a tool to discourage painters' opportunism by specifying the rights and obligations of all parties. This approach points to the commission's value (that is, the price of the painting) as an important determinant of the completeness and content of contracts. The second approach highlights the role of reputation as an enforcement mechanism and its substitutability to formal contracting. This

¹ By "transaction costs" we mean the costs of specifying and enforcing claims (Allen 1999).

approach may identify the painter's age at the time of the commission as an influence on patrons' contractual decisions.

Empirically, we find substantial evidence in favor of the first approach. Patrons wrote significantly longer and more exhaustive contracts when awarding especially remunerative commissions. The content of these contracts similarly reflect patrons' fear that more valuable commissions would increase painters' benefits from shirking and indulging in excessive delegation. Also consistent with the first approach, we find that a commission's value increased the likelihood that patrons explicitly committed to enforcement by third parties. Finally, higher prices encouraged patrons to impose limits on delegation on painters most likely to employ other skilled artisans.

Our results provide little evidence that age-related reputation significantly affected contracting practices in Renaissance Italian art markets. In other words, our empirical findings reject the joint hypothesis that reputations matter for contracts and age matters for reputation. We find only one instance of the painter's age having a statistically significant effect: dealing with an older painter lowered the probability that a contract would specify how expenses were to be shared. We also find some evidence that age affected how patrons chose to enforce contracts and evidence of potential nonlinearities between age and patrons' preferred enforcement mechanism.

Our arguments borrow directly from two bodies of literature in the economics of contracts, one emphasizing the influence of transaction costs on institutional choice (Williamson 1979; Barzel 1997) and the other highlighting the role of reputation in facilitating trade (Klein and Leffler 1981; MacLeod 2007; Leeson 2022). Both bodies of literature rely on the assumptions that real-world contracts can never be complete—in the sense that they cannot make provisions for all possible future circumstances—and that their enforcement is not free (Hart 1987). They also emphasize that real-world markets function thanks to a mix of formal and informal contracts, always short of complete and enforced by a combination of government-run courts, private arbitrators, and market responses such as vertical integration and brand names (Klein, Crawford, and Alchian 1978; MacLeod 2007).

We contribute to this literature by providing systematic evidence regarding the effect of transaction costs on the content and structure of the contracts that governed the exchange of Renaissance art. Our findings support the claim of Al-Najjar (1995) that the characteristics of the commodity exchanged influence the equilibrium degree of contractual completeness. Our results are also consistent with those from the study of a completely different industry: trucking. Hubbard (2001) finds that shippers and carriers in the trucking industry select more complex contractual forms when negotiating over longer hauls than shorter ones, which he attributes to the difference in the magnitude of quasi rents between the two.

Our article relates to two other bodies of work. The first is the application of the economics of contracts to historical settings. Umbeck (1977), on the contracting practices of gold miners during the California gold rush of the 1840s, is an early contribution to this literature. Other examples in this literature in-

clude Dari-Mattiacci (2013) on slavery in the antebellum American South, Leeson (2007a, 2007b) on trade between European merchants and indigenous African tribes and 18th-century pirates, Silverman and Ingram (2017) on maritime trade in the 18th century, and Ellickson (1989) on the whaling industry in 19th-century New England. We also contribute to the economics of Renaissance art markets. Etro and Paganì (2013) and Etro (2018) find evidence that prices in the primary market for paintings in Renaissance and early modern Italy were driven to their competitive level by the rivalry between artists. Owen (1977) relies on monopsony theory to argue that stylistic differences between the Florentine and Siennese schools of painting—the two primary schools in central Italy throughout the early Renaissance—were due to a difference in sensibilities between the elites of the two Tuscan cities.²

2. The Market for Paintings in Renaissance Italy

The Renaissance period in Italian art starts in the last decades of the 13th century, with Giotto's revival of the forgotten art of painting, and ends with Michelangelo's mastery of it in the first half of the 16th century. No summary of the development of the market for paintings spanning 2.5 centuries can do justice to its complexities.³ However, the following generalizations set the stage for the discussion below.

By the 14th century, the market for paintings was regional in scope. While each painter may have operated mainly in one city, he accepted jobs and spent some time in other urban or rural centers. These regional markets featured significant degrees of competition on both the demand and supply sides.⁴ In the case of the former, we find a wide array of religious and secular institutions—including guilds and professional associations, monasteries, and local governments—as well as private individuals—like wealthy merchants, bishops, and feudal lords—all rivaling each other to secure the services of the most renowned masters. On the supply side, there appear to have been several dozen painters operating in all major art centers. For instance, over 40 of them worked in Florence by the 15th century (Wackernagel 1981). Local monopolies or oligopolies were unlikely to emerge and survive since painters were itinerant, and guilds seem to have been uninterested in enforcing or unable to enforce entry restrictions for much of the period (Baxandall 1988; Thomas 1995; Piano and Tanner 2022). Consistent with

² See also Piano and Hardy (2022) for an economic theory of the decline of the Florentine school of painting.

³ Interested readers may consult the discussion in Etro (2018) for an economically informed overview of Renaissance art history. For more extensive treatments, see the classic Goldthwaite (1993).

⁴ Throughout the period under consideration, painters from one town in northcentral Italy would often receive and execute commissions from towns throughout the region and in some instances from towns south of Rome. The same was true already of Giotto, the great Florentine master of the early 14th century, who was awarded commissions from as far away as Padua, over 100 miles from Florence. Among the commissions in our data set, the median distance between the commissioned painter's main town and that of the commissioning patron was 47 miles. The largest distance between a painter's and patron's hometowns was 261 miles.

the above, Etro (2018) finds strong evidence of the law of one price in the Renaissance art market.

The two most popular formats for Renaissance paintings were frescoes and altarpieces. The former format consisted of larger paintings that generally required the application of water-based colors on walls and ceilings covered in a special plaster while still wet. Altarpieces were almost always made of wood panels, also covered in layers of plaster, but the paint used was egg or oil based. Although generally less popular during this period, other media for paintings included banners and canvasses. The latter were especially common in Venice, where weather conditions and the ocean's proximity led to the quick deterioration of frescoes.

Regardless of the format, paintings were complex commodities with several valuable inputs, including gold, precious stones, wood, and the time and effort of the painter. A master would generally rely on several assistants to aid him in making a painting. They formed his workshop and were involved in various tasks, from the production of pigments to the gluing together of wood panels to the drawing and painting of minor figures and backgrounds.⁵ While the degree of delegation varied from workshop to workshop, masters were invariably in charge of designing the painting's composition and painting all major figures.⁶

Paintings were expensive commodities. By the second half of the 15th century, the price for a panel by an established master varied from 7 florins for a small piece to 500 florins for a larger and more elaborate altarpiece (O'Malley 2013, pp. 120–23). A large fresco painting could cost up to three times as much as the most expensive panel painting. For comparison, per capita gross domestic product in the northcentral Italy in 1500 was approximately 460 florins.⁷

In his investigation of the determinants of the price of paintings in Renaissance Italy, Etro (2018) finds that the value of a commission was a function of a painting's size, number of figures, and reputation of the commissioned artist. The larger the painting, the higher the price. The same applied to the number of figures. Etro (2018) argues that this may have been correlated with the quality of the painting since masters were less likely to delegate the execution of figures to their less experienced and often less talented assistants.

Measurable characteristics were not the sole determinants of a painting's price and quality. To be recognized as a true masterpiece, all the figures, objects, and backgrounds of a painting would have been carefully planned and drawn as realistically as possible. Its design and composition had to be original, and the overall

⁵ See the discussions in Thomas (1995) and Piano (2022) for more on the division of labor in the workshop.

⁶ It took 1 year to complete the average commission at the beginning of the Renaissance. By the 16th century, productivity had increased significantly—likely thanks to the growth in the size of the average workshop—and masters seem to have been able to complete six commissions in 1 year (Vasari 1998, p. 281).

⁷ Table 1 in O'Malley (2013, p. 120) relies on an implied exchange rate between florins and Florentine lire of between 6.6 and 6.8 in the late 1400s. Malanima (2011) estimates that per capita gross domestic product (GDP) in central and northern Italy in 1500 was 81.7 Florentine lire. Malanima (2011) further argues that the silver content of this coin remained constant between 1481 and 1502, so we can estimate that GDP per capita in florins was approximately 460 florins.

painting needed to give the impression that it had been made effortlessly (Vasari 1998, p. 280). Most artists excelled in some but not all these feats, a fact that was understood by patrons and connoisseurs (Baxandall 1988, p. 40). For instance, the popular Sieneese painter Simone Martini “possessed a natural talent for invention” but “did not excel in design” (Vasari 1998, p. 42), and Raphael’s greatest strength was in design and composition (Vasari 1998, p. 332).

A good reputation was crucial to succeed in this market (O’Malley 2013). In deciding whom to award a commission, patrons evaluated a master’s skills and creativity by assessing his previous work or soliciting experts’ opinions, including those of other masters.⁸ Patrons also cared about a painter’s reputation for organizational and managerial abilities (Welch 2000, p. 79) as well as for timeliness and honesty (O’Malley 2013). Predictably, Etro (2018) finds that more established masters earned a premium over beginners. However, his analysis shows that this relationship reversed as artists grew old.⁹

Like most commerce in late medieval and Renaissance Italy, trade between painters and patrons relied on professional associations, municipal and religious courts, and private arbitrators for support (Ogilvie 2011; Ascheri 2013). Crucial to the effective operation of this complex legal system was the use of written accounts of a deal’s terms and conditions. Whenever a commission for a new painting was awarded, the patron and the artist would come together to sign a contract prepared by a professional notary, one of several hundred living in any of the largest Italian cities of the period (Ogilvie 2011, p. 294). Private adjudicators would use its content—and, if they failed, secular tribunals or religious ones—to resolve potential disputes (Kuehn 1987, p. 299). In Florence, where painters generally had membership in the *Arte dei Medici e Speziali* (the guild of physicians and pharmacists, one of the seven major guilds of Florence), they had access to—and were subject to the jurisdiction of—the *Mercanzia*, a commercial court of appeal and the most powerful tribunal in Florence (Najemy 2008, p. 110). The importance of written contracts in Renaissance art markets is confirmed by the fact that—on top of having them certified by notaries, often in the presence of several reputable men acting as witnesses—both parties would often make copies of them for their records, which has allowed some of them to survive to this day (O’Malley 2005).¹⁰

⁸ The quality of an artist’s past work was public knowledge to a considerable extent. Most paintings were meant for public spaces, like churches and municipal buildings, even when the patron was private rather than corporate (Nelson and Zeckhauser 2014). Renaissance painters kept informed about each other’s latest work and often traveled to distant towns for the sole purpose of observing or studying a new painting (Vasari 1998).

⁹ This effect may be due to the weakening of reputational concerns (O’Malley 2013). As a painter approaches old age, fear of losing future commissions may not be enough to motivate him not to cheat, whether by using lower-quality inputs, rehashing old designs, or delegating too much to his assistants.

¹⁰ The historical record shows little direct evidence of commissions awarded to Italian Renaissance painters that did not involve the compilation of a formal contract. This fact is hardly surprising given the commodity’s monetary value and the intertemporal nature of the exchange. However, there are substantial obstacles to appraising the historical role of unwritten agreements. Even if such an agreement had existed, the absence of a written record could just as easily be explained by its having been lost or destroyed over the past few hundred years.

3. Formal Contracts in Renaissance Art Markets

To better understand the role of formal contracts in Renaissance Italian art markets, we tracked down original sources for 90 individual commissions for paintings from 1285–1530 using an array of secondary sources, mainly O'Malley (2005) and the Italian Renaissance Document Site at the University of Kent. Of these documents, 75 are texts—in a few cases, partial texts¹¹—of the commission contracts, and the remaining 15 documents are summaries of contracts made contemporaneously by either the patron or the painter for accounting purposes. Figure 1 provides an example of one such document. It shows the front page of the commission contract from 1466 between Benedetto de Lazara and painter Pietro Calzetta for a fresco in the Basilica of Sant'Antonio in Padova.¹² Included in our sample are texts of commissions awarded to some of the most prominent painters of the period, including Duccio, Fra Angelico, Filippo Lippi, Domenico Ghirlandaio, Pietro Perugino, Giovanni Bellini, and Raphael. Secondary figures and little-known painters are also represented, including Priamo della Quercia and Sano di Pietro, as well as painters of so little historical consequence that virtually no trace of them has survived, as in the cases of Nastagio di Gaspare and Angelo Zotto.¹³

3.1. *The Content of Renaissance Art Contracts*

A typical commission contract in Renaissance Italy begins with an introduction that consists of a religious invocation followed by the date and location of the agreement. The document then identifies patron, painter, and witnesses. Among the latter, a notary or legal scholar is often referenced as the drafter of the document. If the commission was awarded by a corporate entity (a religious order, a guild, or a local government), the document might briefly discuss the deliberative process that resulted in the commission.

The text then discusses the obligations of the commissioned painter. These may include references to the physical characteristics of the painting—like its size or whether it was to be a fresco, altarpiece, or some other medium. Frequently, the text of a commission discusses what the final product ought to look like, beginning with its subject. In some cases, the contract contains just a brief reference to it. For example, the commission between Pietro Perugino and the Servites of Porta Eburnea mentions that the painting is to depict a Madonna with Child Jesus—a popular subject of Renaissance altarpieces—but offers no further direction. In other cases, a document might contain a detailed description of the final painting. An extreme case of the latter is Isabella d'Este's commission to Pietro Perugino:

Pallas should seem almost to have vanquished Cupid, having broken his golden arrow and cast his silver bow underfoot; with one hand she is holding him by the bandage which the blind boy has before his eyes, and with the other she is lifting her lance and about

¹¹ Some of the sources for the texts exclude formulaic introductions and conclusions.

¹² The document belongs to Getty Research Institute Special Collections.

¹³ Sources of the documents are in Section OA1 of the Online Appendix.

1566. a di 17. d'Aprile in palazzo al banco de orologia 75

Sia manifesto a cadauno de loro in questo scritto come messer Bernardo lo lascera
conuen & da a messer Piero Calcegiu deponere a dipingere una capella
messa ne la chiesa de Santo Antonio la q̄ si chiama la capella del corpo
de Christo: ne la q̄l debbe p̄ma fare nel sepolcro in fresco i quattro
pp̄mi p̄uocatori in campo azzuro con stelle doro fino: sic̄ et̄ tuti li
figuoni et̄ sono ne la d̄ta capella. siano adorna doro fino & d'azzurro
& similiter lo figure di marmo et̄ s̄no inquadrate lino adorna doro &
d'azzurro con lo suo colono: & et̄ s̄no li p̄ncipali siano messe le arme
con el suo canero doro & d'azzurro. sic̄ et̄ li capitelli de lo colono grande
et̄ sono quattro siano tuti messi doro fino & d'azzurro.

Item che ne la d̄ta capella sia fatta y el soprasso messer Piero una pa-
tauola et̄ sopra qua la faccia donanzi da l'altare fina sotto el volto
con uno scudo de ferro & in la d̄ta crocia del dipingere el d̄to
messer Piero una historia simile al Squizzo et̄ v̄ s̄no questo foglio: el q̄l
e ritratto da un disegno de messer Simone Squarzon el q̄l se de man
de Nicolo Pizolo: el q̄l de fare simile a quello & azzurro de fu-
ra cose de quello & nel d̄to squizzo: & debe & metter ne la d̄ta
tauola le arme del d̄to messer Bernardo de relicuo.

Item el d̄to messer Piero de fare lo soprascritto cose a cura sue spese: si
de oro come di colori: & enuole: & armature: & dogni altra spesa
et̄ habbe ad honore ne la d̄ta fabrica. sic̄ debbe fare el d̄to messer Piero
una colima de tela azzura et̄ sia bona: con el ferro et̄ sopra la d̄ta
tauola: depona co uno Christo passo et̄ sia bello

Item el d̄to messer Piero se vbliga de haue finiti tuti li soprassiti lauorieri
a p̄sca de marzo proximo et̄ de require.

Item el d̄to messer Piero se vbliga de p̄uocare de dire el d̄to lauoriero ben
fatto & adorna politamente: & sta a managnere et̄ el d̄to lauoriero
s̄no ben fermo & sufficiena fina a anni xxx. & in caso el d̄to
lauoriero mandasse y diffetto del d̄to messer Piero: el d̄to messer Piero
sia obligato a pagare el danno & p̄uocasse del d̄to lauoriero: & el d̄to
messer Bernardo possa assignare messer Galeazzo misser el d̄to messer
Piero in solidu: el q̄l messer Galeazzo e sottoscritto de sua man.

Volera charta

Figure 1. A Renaissance painting commission

to kill him. By comparison Diana must seem to be having a closer fight with Venus for victory. Venus has been struck by Diana's arrow only on the surface of the body, on her crown and garland, or on a veil she may have around her; and part of Diana's raiment will have been signed by the torch of Venus, but nowhere else will either of them have been wounded. (contract 66 in Table OA1 in the Online Appendix; Chambers 1970, p. 136)

The description of the commission continues for several more paragraphs.

If a document did not include a lengthy description, a preliminary sketch of the painting's composition (made by the awardee and agreed on by the patron) might be attached instead. Also common, a contract might specify what kind of precious materials were to be employed in the production process. For instance, it might list whether the artist was to apply gold leaf on the painting's surface or whether he was to use pigments made from rare stones.

Commission documents often mentioned that a painter was required to produce the artwork entirely by himself. We find a typical such reference in Luca Signorelli's agreement with the Opera del Duomo di Orvieto in 1500, which reads, "And said work master Luca himself is required to execute and paint by his own hand [*sua mano*]" (contract 62 in Table OA1; Vischer 1879, p. 352). Other times, while a contract did not require the painter to execute the entire painting without assistance, it would identify which sections had to be made *sua mano*. Thus, the agreement between Pinturicchio and Cardinal Giovanni Piccolomini from 1502 references the former's obligation "to do all the designs of the stories in his own hand on cartoon and on the wall; to do the heads all in fresco by his own hand, and to touch up in *secco* and finish them to perfection" (contract 66 in Table OA1; Chambers 1970, p. 27).

Commission contracts might attempt to set expectations for the quality of the final painting. One popular clause specified that when gold leaf or pigments derived from precious materials were to be employed, they had to be fine or of high quality. Similarly, a contract might require that the final painting be at least as beautiful as some other work by the commissioned master. One such example can be found in the text of a contract for an altarpiece between Benozzo Gozzoli and the Compagnia della Purificazione: "Benozzo is obliged to paint it in such a way that it exceeds all the good painting so far done by the said Benozzo, or at least equals it" (contract 28 in Table OA1; Chambers 1970, p. 54). Alternatively, a document might say that the painting was to be executed such that experts would recognize its quality. For instance, a 1496 commission between Pietro Perugino and the Arte del Cambio of Perugia required the former to execute a painting "good and perfect in the opinion of other good and qualified masters and of people with knowledge of this art" (contract 90 in Table OA1; Sartore 2013, p. 533).

A commission document might contain restrictions on the master's ability to accept other jobs for the duration of the commission. In a contract between Bartolomeo Montagna and the Scuola Grande di San Marco in Venice, the former agreed to "make the aforementioned painting and not work on anything else" (contract 41 in Table OA1; Borenus 1909, p. 214). Benedetto Bonfigli—awarded

a commission by the city of Perugia—agreed “to work continuously on painting in the aforementioned chapel whenever he can. And, for the duration of such work, he may not accept any other work until he has finished and delivered the present one” (contract 25 in Table OA1; Mancini 1992, p. 152).

Virtually every commission text specified the date by which the painter had to execute the artwork. Some documents also specified the method of delivery, including whether the painter was to perform this task himself. After listing the painter’s obligation, a commission might mention a variety of financial matters. These include who was to bear the production expenses (wholly the painter, wholly the patron, or some combination of the two), the master’s compensation,¹⁴ and the method of payment.

Finally, a typical commission contract might mention a variety of mechanisms for its enforcement. One popular mechanism was the private adjudication known as *lodo*. Patron and painter would agree to have one or more individuals, often art experts or other painters, evaluate the case should there be any disagreement.¹⁵ For example, Priamo di Pietro della Quercia and the representatives of the Church of San Michele in Volterra agreed that any dispute over the value of the painting was to be adjudicated “by two citizens of Volterra, one elected by [the Church] and the other by said master Priamo” (contract 16 in Table OA1; Milanesi 1854, p. 206). In other cases, the contract would identify an individual whom both parties recognized as competent in such matters. Thus, Domenico Ghirlandaio and patron Giovanni Tornabuoni agreed, in a contract from 1485, to have the final work evaluated by “a just man” (contract 46 in Table OA1; Chambers 1970, p. 175).

Renaissance art contracts also relied on other instruments to ensure compliance, including penalty clauses for late work, warranties, and delayed payment. Another tool for enforcing such contracts was to force the artist to offer collateral. For example, in Lorenzo Lotto’s contract with the Compagnia of Santa Lucia in Jesi, the master had set as collateral “all assets present and future” (contract 88 in Table OA1; Annibaldi 1980, p. 150). The same text references the fact that patrons had agreed to the same. Moreover, each party was entitled to “induce, force, compel, motivate, banish, tie, imprison [the other party] until all obligations have been met.”

¹⁴ See Section OA2 in the Online Appendix for a description of how we calculated the artist’s compensation.

¹⁵ It is not clear how often commissions resulted in the formation of a *lodo*. Few primary sources on *lodi* seem to have survived. Milanesi (1901) reproduces the text of documents of *lodi* related to the market for paintings from the Italian Renaissance. These include the *lodo* resolving a dispute between one Niccolò Bartolini (the patron) and Giosuè di Santi di Gregorio (the painter). The document was drafted by painter Antonio di Tommaso, who had been entrusted to adjudicate the case (Milanesi 1901, document 137). Another text in Milanesi (1901, document 160) reports the process for selecting adjudicators in the dispute between painter Francesco di Giovanni and the Company of St. Andrew over the price of an altarpiece.

Table 1
Summary Statistics

	<i>N</i>	Mean	SD	Min	Max
Length	90	480.4	343.07	101	2,176
Index	90	5.84	1.59	1	9
Contract	90	.83	.38	0	1
Full	90	.77	.43	0	1
Altarpiece	90	.57	.5	0	1
Fresco	90	.32	.47	0	1
Other	90	.13	.34	0	1
Age	85	47.02	13.95	22	85
Price	81	100.98	142.7	.76	840
Log(Price)	81	3.98	1.19	-.28	6.73
Commissions per painter	39	2.08	2.84	1	14
Painters' age spread	34	6.03	10.7	0	39

3.2. Quantitative Evidence

Not all commission documents from Renaissance Italy looked the same. Indeed, variation in content and structure was considerable. To quantify this variation, we analyzed the texts in our sample and extracted information about a variety of items. We then organized this information along three dimensions. The first is contractual completeness, or the degree to which a formal agreement explicitly specifies the obligations of all parties involved. The second is a text's content: two documents may be characterized by the same degree of completeness but focus on different issues. The third is enforcement, as parties to an agreement may choose to have it enforced by a variety of mechanisms. Finally, we extracted information about the identity of the commissioned painter or painters, the type of artwork, and the expected value of the commission. In combination with secondary sources, we also calculated the age of a painter at the time of a commission.

Table 1 provides summary statistics for these variables. (Table A1 includes definitions of the variables.) Our sample contains 90 commissions awarded to 39 painters.¹⁶ Of these documents, 49 commissioned an altarpiece, 27 commissioned a fresco, and 12 commissioned some other type of painting, such as a drape or canvas. Two of the documents contain commissions for one altarpiece and one fresco. The painter with the most commissions is Pietro Perugino with 14, followed by Luca Signorelli with 13.¹⁷ The youngest painter mentioned in our texts is the 22-year-old Raphael, while the oldest is Venetian master Giovanni Bellini at 85. At the time of commission, the average age of a painter was 47. Figure 2 shows the distribution of the variable Age in our sample. For the same painter,

¹⁶ Our sample also contains six commissions awarded to teams of painters. Thus, the total number of painters mentioned in our texts is 46, seven of whom appear only in commissions awarded to teams of artists.

¹⁷ Perugino's name also appears in two commissions awarded to teams of painters.

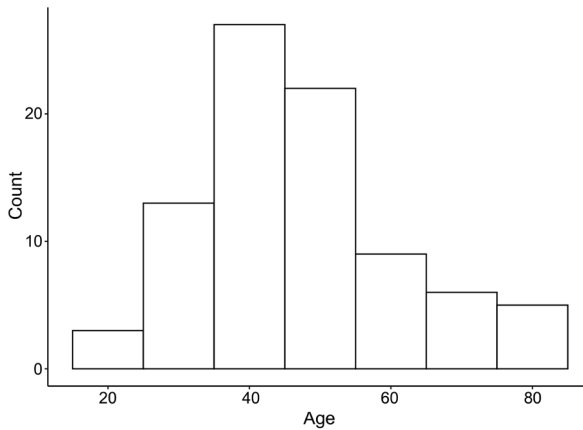


Figure 2. Distribution of Age

the largest spread between age at first and at last commission is 39 years, belonging to Luca Signorelli. On average, the age spread is just above 6 years.

3.2.1. Completeness

Our approach to measuring the completeness of a commission document is twofold. First, we count the number of words in the text. This measure has the advantage of objectivity and relies on the assumption that a more exhaustive contract tends to be longer as well. However, this method cannot tell us how many items appear. Thus, we constructed a second, more direct measure of completeness. On the basis of our qualitative understanding of Renaissance art contracts, we identify 10 items, and for each item we ask whether it is mentioned in the contract. We then combine them into an index of contractual completeness and assign a value between 0 and 10 to each document. The 10 components are the following:

Look. Does the commission document mention the subject or size of the painting?

Materials. Does the commission document specify any of the materials to be used in making the painting?

Quality. Does the commission document reference the absolute or relative quality of the painting?

Deadline. Does the commission document specify a delivery date?

Compensation. Does the commission document contain the amount of compensation to the painter?

Enforcement. Does the commission document reference any enforcement mechanisms?

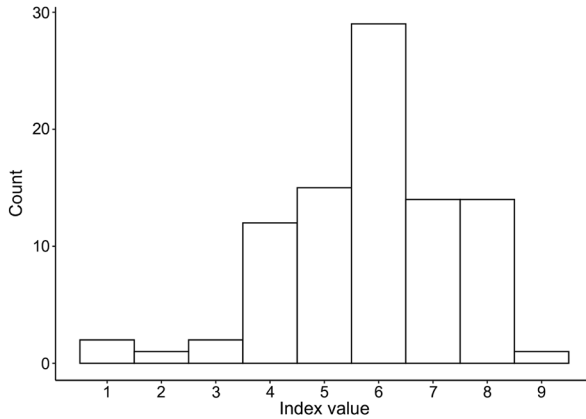


Figure 3. Index of contractual completeness across commission documents

Authorship. Does the commission document contain specific restrictions on the artist's ability to subcontract?

Delivery. Does the commission document specify how the contract is to be delivered?

Employment. Does the commission document contain restrictions on the artist's ability to accept other jobs?

Expenses. Does the commission document specify how expenses are to be shared between the agreeing parties?

The two measures of completeness in Table 1 indicate that the shortest document in our sample consists of just 101 words, while the longest is over 20 times as long. The mean length is 480 words. When looking at our Index measure, we find that the least complete document discusses only one of the components. At the other extreme, the most complete document references nine of the 10 components. The mean index value is close to the modal value: of our 90 documents, 28 have an index value of 6. Figure 3 shows the distribution of Index in our sample.

3.2.2. Content

When we turn to each component of the index separately, we find that variation exists not just in the documents' degree of completeness but in their content as well. Table 2 provides frequencies for each component. References to some items, like compensation and look, are ubiquitous, appearing in 90 percent or more of the texts. Other items were significantly less popular. The least common items, delivery and employment, appear in fewer than 20 percent of the documents.

Table 2
Frequency of Contractual Terms and
Enforcement Mechanisms

	Frequency
Index component:	
Compensation	.956
Look	.9
Expenses	.744
Materials	.711
Quality	.678
Deadline	.667
Enforcement	.478
Authorship	.333
Delivery	.189
Employment	.189
Enforcement mechanism:	
Delayed	.467
Penalty	.233
Lodo	.178
Warranty	.122
Collateral	.078

Note. Frequency refers to the share of documents in the sample that references the category.

3.2.3. Enforcement

One component of our index of contractual completeness is Enforcement, and patrons relied on various enforcement mechanisms to ensure compliance. Some were formal mechanisms that assumed the cooperation of third parties, including public courts and guilds. We identify these as Penalty, Lodo, Warranty, and Collateral.¹⁸ We also looked at whether a document contains references to the self-enforcing strategy of delaying payment of some share of the compensation until after completion. Table 2 indicates that Delayed was by far the most popular enforcement mechanism, appearing in approximately half of all texts. Penalty clauses were the second most common mechanism. References to *lodi*, warranties, and collateral appear in fewer than one-fifth of all documents, with the latter referenced by only seven texts.

4. Transaction Costs in Renaissance Art Markets

In a world of positive transaction costs,¹⁹ the possibility of opportunistic behavior poses a constant threat to the viability of market transactions.²⁰ Renais-

¹⁸ The mention of any of these mechanisms results in Enforcement taking a value of one in our index. Thus, Enforcement indicates explicit reliance on third parties to ensure compliance. Since collateralization required courts to force the transfer of the painter's assets to the patron, we treat it as an instance of third-party enforcement.

¹⁹ As mentioned in note 1, we follow Allen (1999) in defining transaction costs as the costs of establishing and enforcing claims over one's ability to dispose of one or more assets.

²⁰ Paraphrasing James Madison, Williamson (1993, p. 97) defines opportunism as "the frailty of

sance art markets were no exception. Parties generally could not rely on a well-functioning, impartial legal system, especially when one of the parties involved (the patron) was often a member of the local ruling class or had close connections to it. Even if they could have relied on effective courts, the nature of the commodity (a piece of art) and its production process would have made the enforcement problem quite challenging. The quality and value of an artistic commodity are ultimately subjective (especially in the context of a commissioned piece of art) in the sense that objective variables such as size, the number of figures depicted, and the number of hours put in by the painter are not reliable proxies for quality.²¹ Primary and secondary accounts of the painting business in Renaissance Italy suggest several sources of transaction costs in this market.

4.1. Precious Materials

A recurrent object of patrons' concern was the handling of precious materials employed in the production of a painting (see O'Malley 2005). During much of the Renaissance, patrons insisted on having large sections of the artwork covered in gold.²² The gold was hammered into thin squares that were then beaten onto the wall's surface or the wood panel before painting so that a significant portion of the gold would eventually be covered by paint. The amount of gold used would vary from commission to commission, but art historians agree that it represented a significant portion of the total cost, somewhere between one-tenth and one-third of the commission price (O'Malley 2005; Diorio 2013).

Patrons feared that painters would pocket most of the money meant to purchase gold leaf and use cheaper substitutes instead. Indeed, in his *Craftsman's Handbook* (a popular introductory text among aspiring artists of the 15th century), Cennino Cennini acknowledged the popularity of this practice, lamenting that many painters had been "embellishing a wall with golden tin, because it is less costly" (Cennini 1933, p. 60).²³ Similar concerns extended to painters' handling of ultramarine blue, a pigment obtained from the grinding of lapis lazuli and the most expensive color—15 times more expensive than its closest substitute—used in Renaissance paintings (Diorio 2013, p. 50). Again, these concerns were not misplaced. Cennini's *Handbook* contains directions on how to "imitate an ultramarine blue in fresco" by mixing it with the much cheaper indigo and white, with the addition of small amounts of ultramarine "in the accents" (Cennini 1933, p. 52).

Although not a precious material, wood was a key input in the execution of commissioned altarpieces. Commission prices would have had to account for expenditures on wood and, if desired, the frame for the altarpiece. These were

motive 'which requires a certain degree of circumspection and distrust' [between all parties to a transaction]."

²¹ Etro and Pagani (2013, p. 395) write that, in 16th-century Venetian art markets, "[c]ontracts were incomplete, however, because the quality of the paintings could be judged by the commissioner (or by dealers and other painters as advisers), but it could be hardly defined ex ante in the contracts."

²² This practice went out of fashion by the end of the 15th century.

²³ Ironically, Cennini then instructs the reader on how to do just that.

significant expenditures. Calculations indicate that the amount spent on wood was comparable to that spent on gold, and larger altarpieces required even more significant expenditures on wood (Diorio 2013, p. 40). Thus, the same forces that would have led a painter to cheat the patron over his use of gold and ultramarine would have been present here. For example, he could have saved on wood expenditures by simply purchasing a smaller, thinner wood panel from a trusted carpenter.

4.2. *Delegation and Shirking*

The value of a painting to a patron was a function of several factors. Among them were the identity of the painter who executed it and its overall look and quality (Baxandall 1988; Nelson and Zeckhauser 2014; O'Malley 2005). The informational asymmetry between patron and painter empowered the latter to defy the former's expectations with regard to both factors. For instance, a painter might excessively delegate to one of his assistants. This would have been especially tempting for most prestigious Renaissance masters, who were the object of constant solicitations for their services, resulting in a volume of potential commissions that could not be executed alone. Such masters faced a choice between declining some commissions or delegating much or most of the painting to subordinates.

Excessive delegation could also affect the quality of the final product. Raphael's execution of the Apostolic Palace in the Vatican is a perfect case study of this danger. Raphael entrusted the painting of one of the rooms almost entirely to an assistant. The result was, in the words of Shearman (1983, p. 52), "a catastrophe . . . a composite of some half-understood recollections of Raphael's works." To avoid similar scenarios, masters trained their assistants to precisely reproduce their style to give the painting a consistent appearance (Comanducci 2000, p. 41). Even though intensive training may have reduced the effect of delegation on quality, it still would have affected the patron negatively if he valued the art for its authorship as well as its quality, as seems to have been the case (Nelson and Zeckhauser 2014).

The quality of a piece of art has always been a highly subjective matter that cannot be contracted on easily (Etro and Pagani 2013, p. 395). This was true during the Renaissance, as contemporaries had a sophisticated view of what contributed to the quality of a work of art (Vasari 1998, p. 280). A master could exploit the complex nature of artistic quality in many ways. He might put little effort into the design of the scene or the studies of the main figures. He might paint a large wood panel or fresco wall with only a few human figures, which required more work, and fill the gaps between them with plain backgrounds. Or he might draw the faces and bodies of main figures sloppily or bungle the foreshadowing, thus giving the painting an awkward and uneven look. Shirking on the production of an original design or composition was also common.

Vasari (1998) mercilessly reports the errors and shortcomings of many established painters during the Renaissance. One particularly egregious example is that of Perugino. A commercially successful and respected master, over time he adopted the practice of employing the same design, down to the same poses and facial expressions for all major figures, in the execution of multiple commissions (Shearman 1983, p. 44). Although Perugino's behavior may have been exceptional for a painter of his status (Vasari 1998, p. 264), the practice was not limited to him (O'Malley 2013).

4.3. *Late Work*

Renaissance patrons seldom received a painting by the agreed-on deadline. Painters overcommitted, accepting multiple commissions at once, in some cases in locations dozens of miles away from each other, which caused them to take much longer to complete the paintings than promised. According to one art historian (Welch 2000, p. 112), a large share of disputes between patrons and artists were about this issue. Some painters developed a reputation for their lateness. For example, a contemporaneous account tells us of Perugino that "he hardly ever finishes a work he has once begun, so long does he take."²⁴ Perugino lived down to his reputation: having promised to deliver a painting on canvas with a mythological subject, the master had not even started to work on it years later.²⁵ Only after the patron threatened to award the commission to another master did Perugino finally bring himself to finish the painting, a full 3 years after the original deadline.

The Augustinian monks of San Donato were not so lucky. They commissioned Leonardo da Vinci to paint an adoration of the magi within 2.5 years, but painting had not yet started 10 years later when da Vinci left Florence for Milan in 1492. The monks waited a few more years but eventually realized that they had to find another artist if they wanted the painting to be made. Filippino Lippi, the lucky recipient of the new commission, delivered the painting to the monks in 1496.

A painter might fail to execute a commission on time because of sudden illness or death. The longer he took to finish a painting, the higher the probability that it would be left unfinished given the myriad of diseases that threatened the lives of Renaissance Italians. For instance, bubonic plague was endemic in Western Europe throughout this period, and even minor infections could lead to death. One finds several recorded instances of masters dying suddenly, including at a young age. Masaccio, one of the great innovators of early 15th-century painting, died at 27 of unknown causes. Raphael, the great master, died at 37, possibly of a sexually transmitted disease. Older masters might be in the process of completing a com-

²⁴ Letter from Francesco Malatesta to Isabella d'Este, September 23, 1502, quoted in Chambers (1970, p. 134).

²⁵ This delay prompted the patron, Isabella d'Este, to write, in a letter to Paride Ceresara, November 10, 1504, "We do not know who finds the slowness of these painters more wearisome, we who fail to have our [commissioned painting] finished, or you who have to devise new schemes every day, which then, because of the bizarre ways of these painters, are neither done as soon nor drawn in entirety as we would have wished" (Chambers 1970, p. 140).

mission at the time of their death. For example, Filippo Lippi died in his early 60s while executing a fresco cycle for the Cathedral of Spoleto. Similarly, in his late 80s, the great Venetian painter Giovanni Bellini was working on a commission when he died in 1516.²⁶

5. The Patron's Choice of Contract

Formal contracts facilitate trade by delineating the rights and obligations of the parties agreeing to a transaction. However, neither complete contracts nor perfect compliance is generally feasible under real-world conditions (Williamson 1979; Barzel 1997). Drafting a more exhaustive contract requires the sacrifice of additional resources, as does the enforcement of each new stipulation. How exhaustive any given contract is in equilibrium (that is, its degree of completeness and particular content) depends on the result "of an optimization process in which relative benefits and costs of additional length and complexity are traded off at the margin" (Hart 1987, p. 6187). In this section, we develop two distinct (although not necessarily incompatible) approaches to the variation in contracting practices in Renaissance Italian art markets and their empirical implications. One approach emphasizes the role of commission's value (the price of a painting), and the other the the commissioned artist's reputation for honesty (varying with his age).²⁷

Our first approach builds directly on the argument from the economics of property rights that the more valuable the asset, the greater the incentive to delineate and enforce claims of ownership over it (Demsetz 1967). This incentive stems from the fact that, as its value grows, so do the returns to attempts to appropriate the asset or some of its attributes (Cheung 1970). Thus, even though delineating rights more exhaustively is costly, in equilibrium the extra costs are compensated by the additional benefits from discouraging opportunistic behavior and facilitating trade.

This approach points to several ways in which the value of a commission might affect a patron's choices with regard to the degree of completeness of a contract and its content. First, larger commissions increase painters' benefits to taking socially destructive actions such as cheating and shirking, which in turn increase the benefits to the patron of a more exhaustive delineation of the parties' obligations. Second, the content of the contracts reflects similar considerations: patrons' expectations for the forms taken by painters' cheating such as the use of cheaper materials, shirking in design and execution, timeliness, and excessive delegation. Hence, we expect that as the value of commissions rose, so did the propensity of patrons to emphasize these factors in the text of the commission

²⁶ The contract between the city of Perugia and the painter Benedetto Bonfigli (contract 33 in Table OA1; Mancini 1992) explicitly references that the plague was currently ravaging the town as an extenuating circumstance in case Bonfigli could not complete the commission by the agreed-on deadline.

²⁷ The choice of two approaches is partly influenced by the limitations of our data and the dearth of theories of contracting that deal explicitly with variation in contractual completeness and the content of written agreements.

contracts. Finally, since patrons would have expected the probability of disputes to increase in the price of a commission, those commissioning more remunerative works would have faced a greater incentive to commit to one or more enforcement mechanisms in their contracts.

This approach is largely silent about the effect of the painter's age on contracting practices. One exception is presented by excessive delegation. At the beginning of their careers, painters worked alone on commissions, but as they grew more established, they headed workshops filled with assistants of varying skills. Thus, older painters would have been better positioned to indulge in excessive delegation. In turn, patrons dealing with older masters would have responded to the greater threat of this particular form of opportunism by being more likely to specify restrictions on delegation in commission contracts.

The second approach to variation in contracting practices relies on insights from the literature on the role of reputation in self-enforcing agreements. To be effective, these agreements require that parties fear large enough losses if they cheat, such as those from forfeiting future business because of a compromised brand or reputation for honesty (Klein and Leffler 1981). According to this perspective, reputation functions as a potential substitute for formal contracting, as the principal might find it less necessary to write an exhaustive contract when dealing with an agent known for her honesty (Milgrom and Roberts 1992, p. 264).

Accumulating a reputation for honest dealings is a process that requires time. Everything else equal, masters in their 50s had an advantage over artists in their 20s in this matter since they enjoyed several more decades of experience in the industry. Thus, if a reputation for honesty reduces the need for contractual completeness, and age is an important determinant of reputation, we would expect contractual practices to have varied with the age of the commissioned painters. This perspective suggests a negative relationship between age and completeness. For the same reason, it suggests that age reduced the probability that patrons would explicitly reference the factors most vulnerable to painters' opportunism: the use of cheaper substitutes, poor execution, delayed delivery, and excessive reliance on assistants.

The two approaches we outline are not necessarily incompatible. Both dynamics might have influenced the contracting practices of Renaissance Italian art markets. If this is the case, then we should expect each variable to have the predicted effect on the completeness and content of the contracts (positive in the case of the commission's price, negative in the case of the painter's age). The two approaches produce explicitly contradictory predictions only with respect to the decision of patrons to use contracts to limit painters' ability to delegate, with the first approach predicting a positive effect of age and the second predicting a negative effect.

Alternatively, we might find that only one set of predictions finds support in the data. For instance, age might have the predicted effects on our variables of interest but the commission's value might not, which would lend credibility to the idea that contracting practices mostly reflected the variation in painters' reputational capital. Or we might find that price, but not the painter's age, has the pre-

dicted effects. This would constitute evidence that the completeness and content of contracts mostly reflected patrons' concerns that more valuable commissions increased painters' benefits from acting opportunistically. The absence of reputational effect might have been caused by sporadic repeated interactions between painters and patrons or by the limits in information technology, which would prevent patrons from sharing their experiences with each other.

Finally, we may find little evidence in favor of either approach. This result could be interpreted in one of two ways. First, the two approaches may simply fail to capture what factors determined the variation in contractual practices. For instance, the art market in Renaissance Italy might have been governed by social norms and unwritten rules that are not reflected in the surviving documents, the content of which was mostly influenced by traditional notarial practices or patron-specific idiosyncrasies.

Second, there may be dynamics not captured by the two approaches that also operated through price and painter's age but that had opposite effects on completeness and content than the ones we predict. For example, a patron awarding a commission for an expensive, complex painting might have been wary of writing an exhaustive contract out of fear that this would encourage the artist to allocate effort away from noncontractible attributes of the painting.²⁸ In this case, we might expect more expensive commissions to produce contracts with a lower, not higher, degree of completeness.

The same prediction (that is, that of a negative effect of price on completeness) would follow if more remunerative commissions were similarly expected to generate larger reputational benefits to painters. Perhaps masters expected patrons to compensate them (on top of the cost of the commission) for their honest dealings by recommending them to their wealthy friends.

Finally, we might not be able to observe the predicted effect of a painter's age at commission on Renaissance contracting practices because of the existence of nonlinearities in age. This possibility is suggested by O'Malley (2005), who claims that Renaissance Italian painters capitalized on their reputations late in their careers by producing subpar work. This hypothesis is particularly relevant in light of the findings in Etro (2018) suggesting the existence of an inverted U-shaped relationship between a painter's age and his compensation.

6. Understanding Renaissance Art Contracts

We now test the empirical validity of our two approaches to variation in contracting practices in Renaissance art markets. Recall that the first approach predicts a positive relationship between a commission's value and contractual completeness, a positive relationship between a commission's value and the probability that factors related to cheating or shirking are mentioned in the contract, and a positive relationship between painter's age at the time of commission and whether the contract includes limitations on delegation. On the other hand, the

²⁸ This logic is the same as that used to explain the popularity of low-powered incentives even in for-profit environments (Holmstrom 1999).

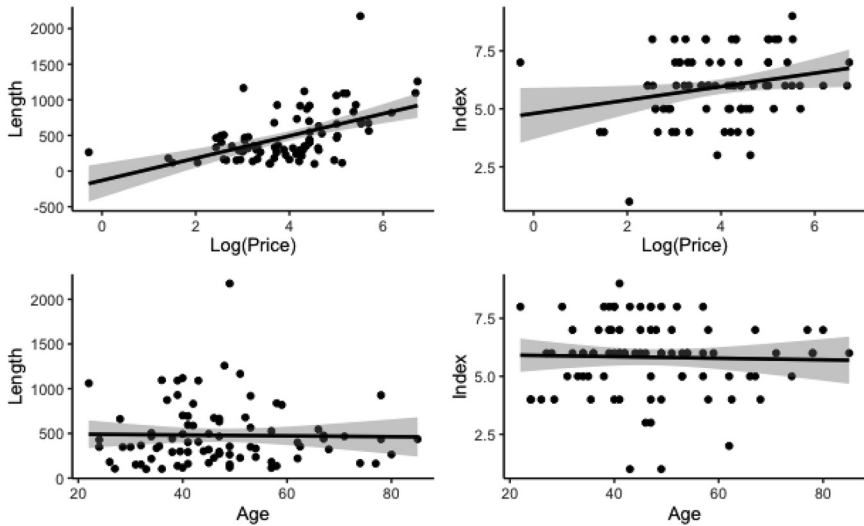


Figure 4. Effects of price and age on measures of contractual completeness

second approach predicts a negative relationship between age at commission and completeness and a negative relationship between the painter's age and the probability that factors related to cheating or shirking are mentioned in the contract.

6.1. Completeness

Figure 4 depicts the relationship between the natural logarithm of the price of a commission and contractual completeness, measured as Length and Index.²⁹ Those plots show that, consistent with our first approach, more expensive commissions produced longer and more exhaustive documents. Figure 4 also depicts the relationship between Age and the same measurements of contractual completeness. We find no evidence of a negative effect of a painter's age on either variable, against the prediction of our second approach. However, the plots fail to control for a great many factors. Hence, we also estimate the effects of $\text{Log}(\text{Price})$ and Age on contractual completeness using ordinary least squares models.

Table 3 provides the coefficients for the effect of $\text{Log}(\text{Price})$ and Age on Index and Length.³⁰ Whether we measured completeness as Index or Length, the coefficients on $\text{Log}(\text{Price})$ are positive and statistically significant. In our sample, a 1-standard-deviation increase in $\text{Log}(\text{Price})$ is associated with an increase of .42 of a standard deviation in the value of Index. A 1-standard-deviation increase in $\text{Log}(\text{Price})$ results in an increase of .85 of a standard deviation in the number of words contained in the associated document.

These results are generally unaffected by whether we include painter fixed ef-

²⁹ We use $\text{Log}(\text{Price})$ instead of Price to account for outliers.

³⁰ For standard regression tables for the underlying specifications, see Tables OA2–OA15.

Table 3
Effects of Price and Age on Completeness

	Mean	Log(Price)	Age
Index	5.844	.557** (.198)	-.007 (.023)
Length	480.4	185.682** (60.922)	3.385 (6.664)
Index component:			
Expenses	.744	.012 (.348)	-.096+ (.056)
Materials	.711	.211 (.473)	.041 (.031)
Quality	.678	.904** (.321)	-.038 (.029)
Deadline	.667	.287 (.248)	.005 (.022)
Enforcement	.478	.634+ (.345)	.033 (.025)
Authorship	.333	.763* (.384)	.035** (.013)
Delivery	.189	.670 (.468)	-.0002 (.029)
Employment	.189	.29 (.397)	-.03 (.050)
Enforcement mechanism:			
Delayed	.467	1.511** (.306)	.029 (.024)
Penalty	.233	.520 (.356)	-.031+ (.017)
Lodo	.178	.064 (.373)	.032 (.061)
Warranty	.122	.245 (.759)	-.028 (.092)

Note. The specifications control for a painter's age and include painter fixed effects. Standard errors, in parentheses, are clustered at the painter level.

+ $p < .1$.

* $p < .05$.

** $p < .01$.

fects.³¹ They are also robust to the inclusion of controls for the type of painting (altarpiece, fresco, or some other art form). Controlling for the type of painting

³¹ See Tables OA2 and OA3. However, note that the inclusion of painter fixed effects in our regressions has a substantial effect on the coefficients on Log(Price) and Age across most of our other tests, including those discussed in Sections 6.2 and 6.3. These effects can be seen by comparing columns 1 and 2 of Tables OA2 and OA3. This pattern can be interpreted as showing that painter-specific reputation, rather than his reputation at a given point of his career, influenced a patron's choice of contract. However, the kind of reputation measured by painter fixed effects tends to differ from that measured by Age. The former is much more likely to track reputation for artistic abilities rather than for honesty and trustworthiness, which more directly relate to the questions of contractual completeness, content, and enforcement.

may be important because the effect of $\text{Log}(\text{Price})$ could be driven by the size of the painting if larger works are more expensive and require the contract to be longer, for instance, to list more materials or mention more scenes and subjects.

We find no systematic relationship between Age and Index or Length. The coefficients on Age in Table 3 are never statistically significantly different from 0. The results are not affected by the choice of controls (see Tables OA2 and OA3). Together, these findings lend support to the approach emphasizing the importance of a commission's price on contracting practices, while they appear to rule out the hypothesis that a painter's age-related reputation functioned as a substitute for contractual completeness.

6.2. *The Content of Contracts*

We now turn to the individual components of our index. Two of the 10 components (Look and Compensation) show very little variation, appearing in virtually every document in our sample. Hence, we exclude them from our formal analysis. For each of the remaining eight components, we use logistic regression to estimate the effect of $\text{Log}(\text{Price})$ and Age. The results are shown in Table 3.³²

According to the first approach, we expect patrons to be especially keen to include references to materials, quality, deadline, and authorship as a commission's value (and with it, the benefits from cheating) increases. Table 3 shows that coefficients on $\text{Log}(\text{Price})$ for these variables are consistently positive. However, only those for Quality and Authorship are sizeable and significant at standard levels. With a 1-standard-deviation increase in $\text{Log}(\text{Price})$, the odds that a contract contained a reference to quality increase by 19 percent. On the other hand, a 1-standard-deviation increase in $\text{Log}(\text{Price})$ is associated with 16 percent greater odds of a mention of authorship. The size and significance levels of these coefficients are robust to the inclusion of painter fixed effects and controls for age and type of painting (see Tables OA4–OA11).

Our first approach also predicts that more valuable commissions would prompt patrons to stipulate explicitly how a dispute would be adjudicated. The results in Table 3 show that the likelihood that the mention of enforcement appeared in a contract rises with the commission's price, with a 1-standard-deviation increase in $\text{Log}(\text{Price})$ being associated with 13 percent greater odds that the contract references enforcement.³³

Finally, our first approach predicts that a painter's age at commission would have a positive effect on the probability that patrons include explicit restrictions on delegation. Table 3 provides evidence of this effect, showing that as Age increases by 1 standard deviation, the odds of authorship increase by 63 percent.³⁴

There is only one other instance of a coefficient on Age meeting standard sig-

³² For standard regression tables, see Tables OA4–OA11.

³³ This result depends on the inclusion of painter fixed effects but is unaltered by that of additional controls. See Table OA8.

³⁴ The size and significance of this effect are largely unaffected by the choice of controls. See Table OA9.

nificance thresholds. The sign of the coefficient on Expenses is negative, which suggests that patrons were much less concerned about specifying who was to pay for what when dealing with older painters. The estimated effect implies that a 1-standard-deviation increase in Age reduced the odds of specifying the sharing of expenses by 74 percent. One could interpret this result as supporting the hypothesis that reputation affected contracting practices in ways predicted by the second approach. However, the overall pattern of results in Table 3 is not especially consistent with this position. Not only is just one of the coefficients on Age statistically significant, but for half of the variables the coefficients are not the correct sign. Together with the results for contractual completeness, the overall pattern of results in Table 3 is markedly more supportive of the first approach than the second. This suggests that contracting practices in Italian Renaissance art markets reflected patrons' efforts to use formal contracts to limit painters' opportunism and not in response to age-related reputational considerations.

6.3. *The Choice of Enforcement*

Although it had little effect on the completeness and content of Renaissance art contracts, the age-related reputation of the painter at the time of commission might have affected contracting practices in other ways. We use logistic regressions to estimate the effect of Age on four enforcement mechanisms. The variables Penalty, Lodo, and Warranty are mechanisms relying on third-party enforcement, whether by public courts or private adjudicators.³⁵ The fourth mechanism, Delayed, differs from the rest because of its self-enforcing nature. To ensure the painter's performance, the patron had only to withhold some share of the compensation until after completion. This did not require the involvement of third parties or the cooperation of the painter.

The results in Table 3 provide very limited support for the hypothesis that the age-related reputation of the painter influenced the choice of enforcement.³⁶ Only one of the four coefficients is significantly different from 0, with 1 standard deviation in Age being associated with 35 percent lower odds of having a penalty clause. This result can be interpreted as suggesting that patrons trusted older painters more than younger ones and thus felt less of a need to rely on penalty clauses when dealing with them. However, we observe no similar dynamic for the other mechanisms.³⁷ For instance, we see no negative effect of age on Delayed,

³⁵ Enforcement mechanisms also include requiring collateral, a guarantee that the patron could appropriate the painter's asset if he violated the terms of the contract, a promise that would have had to be enforced by third parties. We exclude it from our formal analysis because it appears in only seven of the contracts in our sample.

³⁶ The results for these logistic regressions are highly affected by painter fixed effects (which we include in our preferred specification) and the inclusion of dummies for type of painting. See Tables OA12–OA15.

³⁷ The results in Table 3 also show that the commission's price had a large effect on whether patrons adopted a self-enforcing mechanism like delaying payment. Combined with the effect on enforcement, this suggests that patrons were more likely to use both third-party enforcement and the self-enforcing mechanism for more valuable commissions. However, note that Log(Price) does not seem to have a significant effect on the choice of third-party mechanism.

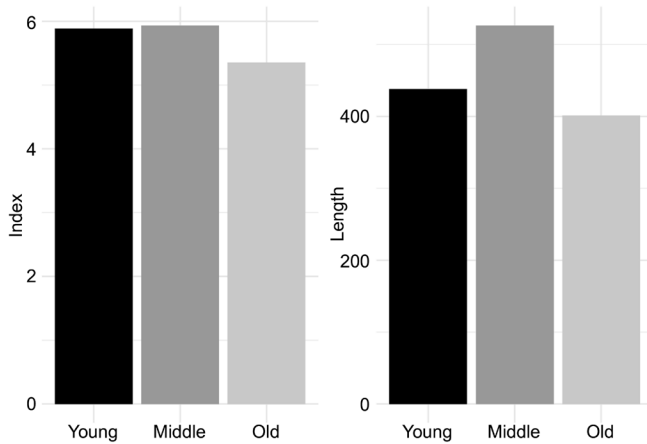


Figure 5. Means of Index and Length across age groups

which may reflect the idea that older painters were more trustworthy. However, the effect is not positive, which appears to rule out the possibility that older painters were less reliably punctual, perhaps because they received more requests for their services, which would have encouraged patrons to disburse the last payment only after completion.

6.4. Nonlinearity in Age

We now examine whether our previous analyses fail to capture the impact of reputation on contracting practices because of nonlinearities between Age and our dependent variables. The existence of such nonlinearities in Renaissance art markets is suggested by the claim that painters would often cash in on their reputation by producing shoddy and unoriginal work in their later years (O'Malley 2005). Consistent with this claim, Etro (2018) finds that commission prices increased over the first half of a painter's career only to peak and then decline over the following decades.

Our sample is likely too small for us to find robust evidence for or against the existence of such age patterns with a formal econometric approach. Hence, we take a more limited and informal quantitative approach instead. We divide our observations into three samples based on the career stage of the commissioned painter. The first contains 26 commissions awarded to young painters, ages 20–39. The second consists of 45 commissions to middle-aged painters, ages 40–59. Finally, the third subsample consists of 14 commissions to old painters, ages 60 and above. We then perform a series of t -tests for the mean differences for our dependent variables across the three age groups. Mean values are presented in Figures 5–7. Table 4 provides the p -values for t -tests between means across the three age groups.

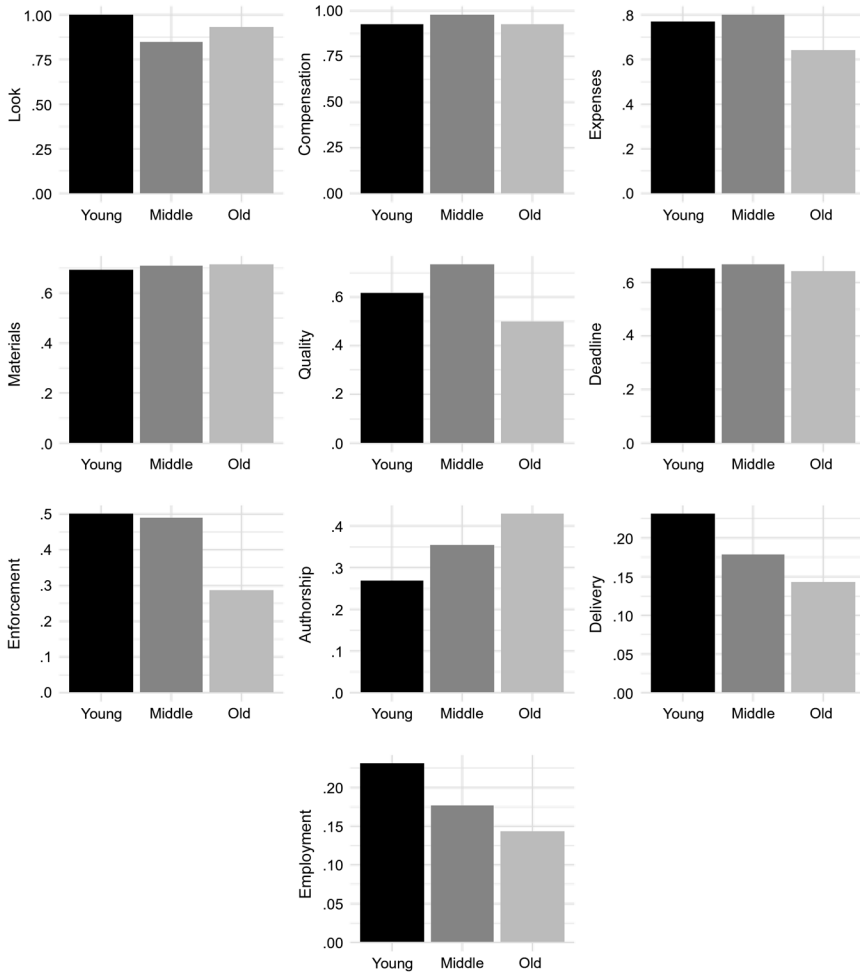


Figure 6. Means of index components across age groups

The bar charts lend some limited support to the idea that a painter’s age had a nonlinear effect on completeness, content, and choice of enforcement. In Figure 5, the sample mean for Length is almost 100 words higher for middle-aged painters than for their younger or older counterparts. We observe the same pattern in whether a document referenced quality (Figure 6) or included a penalty for failure to perform (Figure 7). However, none of these differences are statistically significant at standard thresholds. Table 4 indicates the statistically significant *t*-tests. To the extent that the effect of a painter’s age on the interaction between patrons and painters differed across the painter’s career, Table 4 suggests that it did so mostly in matters of the choice of enforcement. Thus, our failure to find

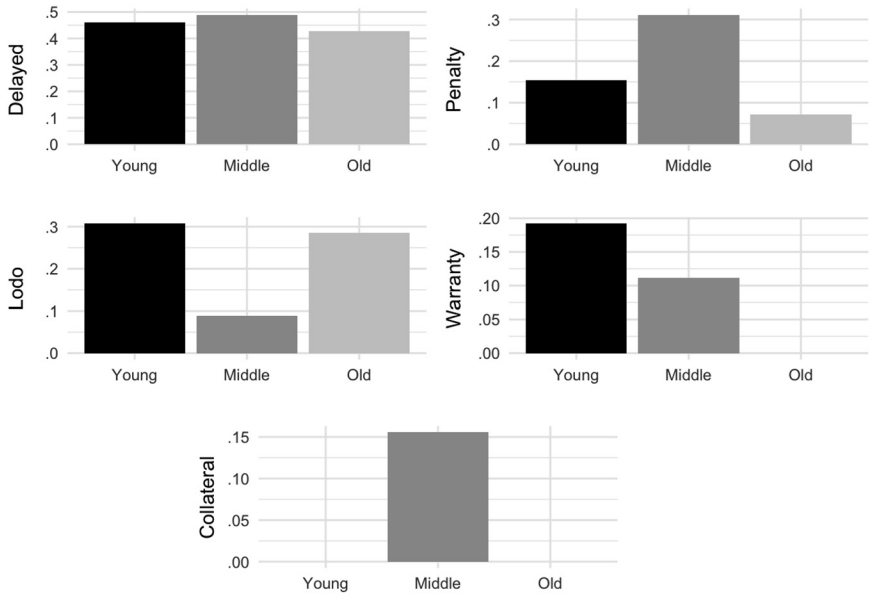


Figure 7. Means of enforcement mechanisms across age groups

evidence for age-related reputational effects on the completeness and content of contracts is likely not due to nonlinearities. Patrons seem to have been keen to rely on the institution of the *lodo* when dealing with young or old artists but not particularly so when doing business with artists at the peak of their careers. Conversely, patrons seem to have found that the effectiveness of penalties and collateral was relatively lower when dealing with young painters or old masters. The findings are striking: while collateral appears in only seven of the contracts in our sample, it is always for a painter between the ages of 40 and 59.

Overall, these results suggest that patrons might have expected the need for, or deterrence effect of, different enforcement tools to vary by the painters' age. For example, the use of penalties and collateral might reflect the existence of wealth constraints among artists early in their careers and the ineffectiveness of monetary punishments as painters approach the end of their life. Alternatively, the relative popularity of using penalties when contracting with middle-aged painters might be due to the efficiency of allowing more popular, busier painters to buy themselves out of an agreement if they receive a more remunerative offer elsewhere.³⁸ However, this hypothesis does not account for the relative popularity of collateral among commissions awarded to painters in the same age group.³⁹

³⁸ We thank a reviewer for suggesting this hypothesis.

³⁹ Moreover, if penalties functioned as suggested, one would expect them to be popular among the youngest of painters, not established painters. The latter would have faced relatively less uncertainty over the variance of the demand over their future services than the former.

Table 4
Differences in Mean Values across Age Groups

	Young/ Middle	Middle/ Old	Young/ Old
Index	.897	.220	.257
Length	.307	.116	.650
Index component:			
Compensation	.350	.520	.951
Look	.007**	.357	.336
Expenses	.768	.295	.430
Materials	.871	.983	.889
Quality	.322	.146	.502
Deadline	.915	.876	.947
Enforcement	.930	.178	.192
Authorship	.454	.643	.339
Delivery	.606	.760	.499
Employment	.606	.760	.499
Enforcement mechanism:			
Delayed	.828	.704	.847
Penalty	.122	.021*	.423
Lodo	.038*	.157	.889
Warranty	.382	.024*	.022*
Collateral	.007**	.007**	N.A.

Note. Values are p -values from t -tests of means. N.A. = not applicable.

* $p < .05$.

** $p < .01$.

The results for Lodo across age groups is the only result in Table 4 and Figure 7 that seems to support the hypothesis of substitutability between age-related reputation and contract enforcement. According to this view, patrons relied relatively little on *lodi* when doing business with middle-aged painters because they were more reliable partners, especially on matters of quality. Younger artists might not have had enough time to establish a reputation for honesty. Agreements with older masters might have suffered from a last-period problem. The two effects would have encouraged patrons to commit to third-party adjudication when dealing with painters from either age group. This result further rules out the possibility that middle-aged painters, being at the peak of their popularity, were especially likely to execute paintings of lower-than-expected quality as they rushed through too many commissions or repurposed designs and figures from previous works.

7. Conclusion

Renaissance paintings were complex commodities exchanged between parties, the patron and the master, who operated in a world of uncertainty—about the quality of the final painting or the potential death of the artist before the painting was completed—and of asymmetric information about the effort of the painter,

the quality of the material, and the involvement of assistants. Moreover, the opportunity cost of most inputs involved—the human capital of the artist, the wood and precious materials used in the execution of the painting—were quite valuable, which means that the benefits from the exchange were high, but so were those from cheating.

This paper studies the role of transaction costs in the production and exchange of paintings in Renaissance Italy. We show that the nature of these commodities was conducive to cheating, especially by the painter. Painters could substitute cheap materials for expensive ones, delegate significant portions of their responsibilities to less skilled artisans, or take much longer than promised to deliver the final product. Patrons responded by drafting formal contracts that varied in their degree of completeness, their content, and the enforcement mechanisms on which they relied.

We ask whether the observed variation in contracting practices reflected one, both, or neither of the following two approaches to contracts. First, patrons may have written longer, more exhaustive contracts to constrain painters' opportunism, in which case we would expect commission values to affect systematically the completeness and content of contracts. Second, patrons may have felt less of a need to draft formal agreements when dealing with painters with a reputation for honest dealing, which might vary with their age at the time of the commission.

In a series of empirical tests, we find substantial evidence of the first approach. Patrons did write longer and more exhaustive contracts for more valuable commissions, and those texts were more likely to contain references to the quality of the painting, method of enforcement, and constraints on delegation. We also find that constraints on delegation were more likely to be imposed on older painters who likely employed skilled assistants in their workshops. Conversely, we find very little evidence that age-related reputation had a systematic influence on contracting practices. The only result consistent with this view is that patrons were less likely to specify how expenses were to be shared when dealing with older painters. However, we find suggestive evidence that reputation affected patrons' choice of enforcement and that a painter's age had a nonlinear effect on the relative effectiveness of alternative enforcement mechanisms.

Appendix
Table A1
Definitions of the Variables

	Definition	Range
Look	Equals one if the commission document mentions the subject of the painting or its size and zero otherwise	
Materials	Equals one if the commission document specifies any of the materials to be used in the making of the painting and zero otherwise	
Quality	Equals one if the commission document references the absolute or relative quality of the painting and zero otherwise	
Deadline	Equals one if the commission document specifies a delivery date and zero otherwise	
Compensation	Equals one if the commission document contains the total compensation to the painter and zero otherwise	
Enforcement	Equals one if the commission document mentions specific enforcement mechanisms and zero otherwise	
Authorship	Equals one if the commission document contains restrictions on the artist's ability to subcontract and zero otherwise	
Delivery	Equals one if the commission document specifies how the artwork is to be delivered and zero otherwise	
Employment	Equals one if the commission document contains restrictions on the artist's ability to accept other jobs and zero otherwise	
Expenses	Equals one if the commission document specifies how expenses are to be shared between the agreeing parties and zero otherwise	
Index	Sum of contractual completeness indicators	1-9
Length	Number of words in the original contract	101-2,176
Paintings	Number of paintings completed by the artist the year of the commission (count of previous completed paintings)	0-101
Active	Number of years the artist was active by the year of the commission	0-50
Age	Age of the artist at commission (estimated from birth year)	22-85
Price	Compensation agreed on in the document (converted to florins)	755-840
Contract	Equals one if the observation is for the commission and zero if a summary of it	
Full	Equals one if the contract is a full document and zero otherwise	
Latin	Equals one if document was originally written in Latin and zero otherwise	
Vulgar	Equals one if the document was originally written in Vulgar and zero otherwise	
English	Equals one if the document is available only in English translation and zero otherwise	
Team	Equals one if the commission was given to a team of painters and zero otherwise	
Artists	Number of artists on the commission	1-4
Clerical	Equals one if the commission was from a clerical patron and zero otherwise	
Altarpiece	Equals one if the commission was for an altarpiece and zero otherwise	
Fresco	Equals one if the commission was for a fresco and zero otherwise	
Other	Equals one if the commission was for another type of painting and zero otherwise	
Vasari	Number of words in the description of the painter in Vasari (1998)	0-17,300
Distance	Miles between the main town of the artist's operation and the patron's town of residence	0-261

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