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1 + 1 > 2? An Exploration into the Market for Collaborative Artworks

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ABSTRACT

What are the effects of collaboration on art prices? The present study explores the market for collaborative artworks with a focus on Zhang Daqian (1899-1983), the "Picasso of the East." Using a unique dataset of Chinese painting and calligraphy artworks (*n*=9,955) sold in auctions worldwide between 1994 and 2022, we identified identify four collaboration types and revealed a network of 247 collaborators and 782 connections, spreading across three stages of the artist's career. With hedonic regression models integrated with network analysis, we provide evidence that on average, the prices of collaborative artworks were lower than those of the single-authored ones, but not all artist's names led to lower prices. We revealed an inversely U-shaped relationship between the centrality of collaborators and prices. Moreover, the prices of collaborative works also varied with the number of collaborators, the name position, and the career stages of the artist.

Keywords Collaboration · Network analysis · Hedonic regression · Art market · Co-branding

Introduction

Artists have long been seen as lonely geniuses (Paraschiv, 2015; Pickering & Negus, 2004). While solitude can be part of the creative process (Knafo, 2012), collaboration is a long-standing practice in the art world (Farrell, 2003; John-Steiner, 2000). In his seminal book *Art Worlds* (1982, p.7), the sociologist Howard Becker points out that "all artistic work, like all human activity, involves the joint activity of a number, often a large number, of people. Through their cooperation, the artwork we eventually see or hear comes to be and continues to be." Not only because the production of works of art, as in the other industries, often requires different sets of skills and great investment in time and resources, but creativity, as one of the major driving forces of the cultural and creative industries, is also seen as the result of social interaction (Csikszentmihalyi, 1996, 2014; Sawyer, 2010; Sawyer & Henriksen, 2024; Simonton, 1990).

Creativity is always collaborative, even when one's alone (Sawyer, 2017). By examining the life cycles of 41 most acclaimed modern painters, Accominotti (2009) shows the important role of artistic movements and interactions in artistic creativity. Investigating 772 Western artists who were active between the Renaissance and the twentieth century, Simonton (1984) demonstrates that great artists are often part of great networks, and that the achieved eminence of artists is often positively correlated with the number of social relationships—famous artists tend to have more rivals, collaborators, associates, friends, and co-pupils. Farrell (2003) dives into the collaborative circles of creatives, ranging from the French impressionists to the founders of psychoanalysis, and unveils how the dynamics of the groups of collaborating friends can affect creative work. Comparing groups of different sizes, Farrell (2003) argues that collaborative pairs make for unparalleled conditions for producing truly important work. In his original book *Powers of Two*, Joshua Wolf Shenk (2014) also sees the pair as the primary creative unit and illustrates that all those lone geniuses—from Van Gogh to Picasso, from Dickinson to Einstein—are merely the better-known halves of the collaborative duos.

If the practice of collaboration in the art world is so prevalent and crucial, how does the market perceive collaborative artworks? Radermecker (2020) notes that, dating back to the 16th and 17th centuries, prestige collaboration, collaboration between esteemed artist pairs, was particularly

successful because buyers get to buy one painting with two names, and the cobranded works were identified by their appealing features such as reputation, innovation, and high quality. In her study on the contemporary market reception of those paintings by Flemish masters, however, Radermecker (2020) reveals that the artistic collaborations are no longer appreciated by the market especially when there is an imbalance in reputation. Surprisingly, to the best of our knowledge, this is the only empirical study[1] examining the market reception of collaborative paintings. This notable paucity of empirical research reflects the scarcity of collaborative paintings in the contemporary art market and indicates the general neglect of this market segment in art market studies.

Understanding the market reception of collaborative works, however, is vital. Not only because collaboration is a common artistic practice and is identified as key to artistic creation, but a better understanding of how the market evaluates collaborative artworks will also inform the branding strategies of artists more broadly (O'Reilly, 2005; Rodner & Kerrigan, 2014; Schroeder, 2005). This can be done through the construction of single artist's brand names (M. Muñiz Jr et al., 2014; Preece & Kerrigan, 2015) and strategic formation of brand alliances to promote competitive advantage, product differentiation, and brand equity (Besharat & Langan, 2014; Boad, 1999; Helmig et al., 2008; Rao & Ruekert, 1994; Turan, 2021), which in turn, presents an opportunity for us to see how the art market navigates the myth of the lone artist in the present time through their consumption patterns within its very sociocultural context.

In the present study, to shed light on the market reception of collaborative artworks, we delve into the vast body of work by the famous artist Zhang Daqian (1899-1983), the "Picasso of the East." While this artist may not be a household name in the West, in China, as well as in the global art market at large, Zhang Daqian is undoubtedly one of the most important artists of the 20th century. On a global scale, his name is often among the market heavyweights like Vincent van Gogh, Andy Warhol, and Pablo Picasso by auction revenue (Artprice.com, 2024). Renowned for his innovative techniques and masterful brushwork, Zhang Daqian is hailed as a pioneer in modern Chinese art. With a legendary career path, the influence of Zhang Daqian transcends national borders and cultural boundaries and his works have been exhibited in the most prestigious galleries and museums around the world. Considered as a first real global artist, Zhang Daqian's works, with a vast range of styles, referenced global culture while deeply embedded in the Chinese roots (Holland, 2022). Zhang Daqian also had the most extensive network among his contemporaries in terms of the width in geographical distribution, the number of fields and people involved, and the closeness of the relationships (Zhu, 2019).

Using a unique dataset of Chinese painting and calligraphy artworks (n=9,955) sold in auctions worldwide between 1994 and 2022, in the present paper, we investigate the network of collaborators of Zhang Daqian, composed of 247 collaborators and 782 connections. Among the collaborative artworks (n=675, 6.8%), there were variations in but not limited to: the types of collaboration, the frequencies of collaboration for collaborators, the numbers of collaborators, and the position of Zhang Daqian's name. We bring insight into what drives the market value of collaborative artworks, and answer four research questions:

i)   *Is there a difference in the market reception between single-authored artworks and collaborative artworks? Is there any difference between types of collaborative works?*

ii)   *Do the names of the collaborators influence the prices of collaborative artworks? What are the effects of the position of names and number of names?*

iii)   *Does the network centrality of collaborators play a role in the prices of collaborative artworks?*

iv)   *Is there a difference in the prices of collaborative artworks in different stages of the artist's career?*

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[1] Garay et al. (2022) examine the prices of paintings by Jean-Michel Basquiat along with his collaborative works executed with Andy Warhol and observe that the collaborative paintings are also less expensive than single-authored works. This investigation, however, appeared only in the Appendix of the paper and therefore was not the main subject of the study.

Collaborative paintings in China

The phenomenon of collaborative painting, where two or more artists work together on the same canvas to depict images and express specific brushwork styles and artistic effects, has a long history in China. The "Golden Bridge Picture" of A.D. 92 is an early example of collaborative painting (Zeng, 2018). The evolution of Chinese collaborative paintings started from the collaborative exchanges of techniques during the Sui (581-618 C.E.), Tang (618-907 C.E.), and Five Dynasties period (907-979) to the literary aspirations of Song (960-1279) and Yuan (1279-1368) literati painters, gradually developed into diverse social integration from the Ming (1368-1644) and Qing Dynasties (1644-1912), into the modern times. From entertainment-oriented, casual literati gatherings combining music, chess, poetry, calligraphy, and painting and devoid of any commercial nature, to modern painting and calligraphy societies oriented towards the market based on the exchange relations of the commodity economy, painters began to move towards professionalism and socialization.

In the dictionary for the renumeration rates of artists, Wang et al. (2004) record several entries for the market prices of collaborative paintings covering the period 1874-1949. We observe that advertisements for those paintings were made by agents such as painting and calligraphy societies, groups of individuals, or art dealers. Advertisements for collaborative paintings from painting and calligraphy societies made up the majority, where organizations usually stated the names of the artists they represent and the corresponding prices for different combinations of subject matters, mounting, and sizes. An excerpt of advertisement from the newspaper of the Chinese Painting Academy in 1943 suggests the general negative reception of collaborative paintings of the Republic of China period (1912-1949): "…most of the usual collaborations come from Yingchou to fulfil social obligations, and are often hated for their sloppiness, but in this case all our artists create their collaborative works spontaneously, and the structure and layout of the work are extremely well thought out, making them true masterpieces of our academy..." (p.11, cited in Wang et al., 2004). Most of the collaborative paintings were priced lower than works by individual artists, still, not all collaborative paintings were sold at a discount; it depended on the artists. And when a same artist collaborated with different artists, the rates could also be different. It would thus be interesting to examine the contemporary reception of collaborative paintings with a large sample of an artist active in the Republic of China period in the current study.

Zhang Daqian: legend, friends, and artistic career

Zhang Daqian (1899-1983) was a painter, calligrapher, seal carver, and poet. Zhang Daqian was a versatile artist, as his paintings encompass various styles including minute and soft, great and majestic, delicate and lovely, smartly and stylish (Xie, 2001). Zhang Daqian was a master of landscapes, birds and flowers, figures, horses, fruits and vegetables, herbs and insects, animals, Buddhism and Taoism (He, 2014). Zhang Daqian was also one of the most prolific artists in China, if not in the world. Over his lifetime of 84 years, it is estimated that he created around 30,000 paintings.

Hailed as "the Brush of the East" by the Western painting world, he was honored as the "First Contemporary World Painter" at the World Modern Art Exposition in America in 1958, the World Newspaper voted him as the "Best Contemporary Chinese Painter" in 1968 (Qian, 2022). Zhang Daqian was also praised by Xu Beihong (1895-1953), another renowned Chinese painter of the 20th century, as "the First Person in 500 Years." Indeed, the artistic success of Zhang Daqian is unparalleled, which could be attributed to his intrinsic qualities such as virtuosity, talent, diligence, and audacity. At the same time, Qian (2022) argues that the ingenious strategies that Zhang Daqian adopted to engage with the market also played a critical role. Compared with his contemporaries, Zhang Daqian held many more exhibitions over his lifetime—as many as 146 times (Li, 1987). Compared with his contemporaries, Zhang Daqian held many more exhibitions over his lifetime—as many as 146 times (Li, 1987). Zhang Daqian also maintained harmonious relationships with his sponsors since an early stage, such as the Family Li, who greatly contributed to his phenomenal success at the first exhibition in his life in the year 1925. Zhang Daqian was also most generous and never hesitated to give away his best works to friends—not even when he became famous and his paintings commanded high prices—those with whom he shared deep friendships often were the ones who received the most artworks (Wan, 2022; Zhu, 2019).

Zhang Daqian was active during the Republic of China period (1912-1949), where there was a rapid development of painting societies. Although literati painters nominally rejected craftsmanship and commercialization of aesthetics, many painting societies have since adopted collaborative work methods and economic operations similar to commercial, craftsmen guilds. This contributed to the production of large number of collaborative paintings.

Data

Our data were gathered from Artron.net, which is one of the most comprehensive online databases of Chinese art and is regularly used in Chinese art market studies (e.g., Oosterlinck et al., 2023). The data are first processed according to the characteristics of the artworks which can be divided into five categories: artwork characteristics (hammer price, subject matter, material, mounting, size), authenticity and quality (seal, creation year, provenance, exhibition history, literature, lot number, certificate), attribution and copies (attribution, copy types), sales context (auction house, location of sale, month of sale, year of sale), and artist's name (artist's name, numbers of collaborator's names, positions of Zhang Daqian's name, network measures if applicable). In the following, we give a description of the main variables for the present research.

Collaboration and prices. Our dataset comprises 9,280 (93.2%) single-authored artworks and 675 collaborative artworks (6.8%). Among the collaborations, the vast majority (82.9%, n=553) bore one extra artist's name, 61 works (9.2%) had two extra author's names, 28 works (4.2%) were with four co-author's names. 8 collaborative works were found for both categories of four and five collaborators' names. As the number of collaborators increased, the observations became far and few between. Table 1 gives us an overview of the sales prices[2] according to the numbers of collaborators.

Table 1. Distribution of sales prices according to the numbers of collaborators.

Artist's names	Frequency (Perc.%)	Mean	Median	SD	Min	Max
Zhang Daqian	9,288 (93.3)	3,722,146	1,334,415	10,033,812	344,093	312,000,000
Zhang Daqian and 1 extra name	553 (5.55)	1,310,585	792,238	1,929,344	339,578	29,315,064
Zhang Daqian and 2 extra names	61 (0.61)	1,936,453	862,871	2,803,390	409,820	15,418,161
Zhang Daqian and 3 extra names	28 (0.28)	3,668,455	1,170,949	8,143,965	437,142	40,267,325
Zhang Daqian and more-than-3 extra names	25 (0.25)	1,717,945	1,380,000	1,125,618	457,470	5,254,600
Entire dataset	9,955 (100)	3,572,057	1,287,098	9,731,296	339,579	312,000,000

Forms of collaboration. We distinguish four types of collaboration in our dataset (Table 2). The most common collaboration was dedicated collaboration, accounting for 58.7% of the collaborative works. The least common collaboration in our dataset was the commentary collaboration (*n*=20). 244 out of 675 collaborative works (36.1%) were complementary collaboration and 21.6% (*n*=146) of the

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[2] To give an idea of the price distribution in 2022 USD: the average price was 531,165, the median was 191,391, the standard deviation was 1,447,044. The maximum price was 47,217,074USD and the minimum price is 51,385USD.

collaborations were done remotely. The identification of types of collaboration largely relied on manual work, the primary source of information for the identification of the types of collaborations was the inscriptions on the artworks.

Table 2. Forms of collaboration.

Types of collaboration	Description	Numbers of works
complementary collaboration	division of labour	244
remote collaboration	collaboration in different time and space	146
commentary collaboration	inscriptions attributed as collaboration	20
dedicated collaboration	collaboration dedicated to someone	396

Collaborators' names. Among the co-branded works, most works were effectively created by two artists[3] (n=522, 94.4%). In total, 151 other artist's names were involved in these co-branded works, among which 101 (67%) only appeared once in combination with Zhang's name, 34 (23%) appeared twice to four times with Zhang's name. 64.2% (n=355) of the co-branded works were created by Zhang Daqian and his frequent collaborators, the ones who coauthored at least ten times with Zhang Daqian.

Positions of Zhang Daqian's name. Among co-authored works, variations may also be observed in the position of Zhang Daqian's name in the sequence of artist's names. In almost half of the cases (51.9%, n=350), Zhang Daqian's name came first, but in 44.7% (n=302) of the cases, his name came last. In merely 3.4% of the collaborative works, his name was in the middle.

Creation year. 65.4% (n=6,507) of the artworks were dated—a high proportion especially compared to Western paintings (for instance, Renneboog & Spaenjers (2013) reported one third of their sample as dated). To capitalize on the information on creation year, we further extracted[4] the dates of the artworks for Zhang Daqian himself, especially for the ones where collaborators were involved (n=667, 6.7%) and where auction houses did not provide explicit dates for the collaborative works. We eventually obtained creation years of Zhang Daqian for 64.8%[5] (n=6,447) of the artworks, which we further classified the artworks according to stages of artistic career (Table 3).

Table 3. Distribution of artworks according to career stages.

Career stages	Description	Collaborative works	Single-authored works	Total numbers of works
Stage A (1919-1943)	traditional, making copies	227	1,702	1,929
Stage B (1944-1955)	personal style integrated in traditional	89	1,814	1,903
Stage C (1956-1983)	western influence; innovative, splash painting	32	2,583	2,615

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[3] The rest (n=31, 5.6%) were works with two specified artist's names but labelled with *et al.*, suggesting the existence of unknown collaborators.

[4] This was done by referring to the inscriptions, gathering the relevant terms for the creation year(s) recorded by the artist, and then searching on the internet for the corresponding dates of creation.

[5] For the 3,512 works where we eventually cannot locate the creation years, it may be due to the fact that: a) the work was not dated by the artist, b) auction houses provided information on dates in the sales catalogue but the information was not helpful in informing buyers of the exact creation year (such as only mentioning it was created in the modern times which is the period the artist belongs to), c) auction houses provided unrealistic information on dates and cannot be corrected easily, such as 1767.

Methodology

Hedonic regression model. Hedonic regression is the most used technique in art market studies to create price indices and capture the effects of each hedonic characteristics on prices. The standard equation is as follows:

$$\log p_i = \alpha + \sum_{j=1}^{m} \beta_j s_{ij} + \sum_{k=1}^{r} \gamma_k x_{ik} + u_i$$

(1)

where $\log p_i$ represents the log of the price of the artwork i, s_{ij} includes the variables directly associated with our research questions, x_{ik} are hedonic variables that are used to homogenize artworks in the sample which we mentioned in the above section, and u_i is a random disturbance. In the model, we included all characteristics described in the previous section. All hedonic variables were dummies, except for the price, size, and lot number.

Social network analysis. Social network analysis (SNA) is a methodology for studying the connections and behavior of individuals within social groups (Clifton & Webster, 2017). Centrality is a property of a node's position within a network. Nodes are important if they are in strategic locations within the network (Borgatti et al., 2013; Wasserman & Faust, 1994). In this study, we focused on three of the most widely used centrality measures: degree centrality, eigenvector centrality, and closeness centrality.

Table 4. Measures of network centrality.

Types of centrality	Meaning	Interpretation
Degree	A node has high degree centrality if it is directly connected to many nodes.	An individual with high degree is more likely to diffuse and receive new information.
Eigenvector	A node has high eigenvector centrality if it is connected to many other nodes which are themselves well-connected.	An individual with high eigenvector centrality is connected to other critical people.
Closeness	A node has high closeness centrality if it lies on average at the shortest distance from all other nodes.	An individual with high closeness centrality can easily communicate with others in a network.

The software package Gephi was used to visualize and calculate the centrality measures of the network. There are in total 248 nodes and 782 edges in the collaboration network[6] of Zhang Daqian (Figure 1). We explore the effects of the network centrality of collaborators on the prices of artworks in the third research question. This was done by integrating centrality measures into our hedonic regression models while focusing on the sub dataset of artist duos with artworks by Zhang Daqian and one extra collaborator's name, accounting for 82.9% (n=553) of our collaborative artworks.

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[6] The network was generated by using the Force Atlas2 algorithm. This network included all the names as shown in the bylines of the co-authored works, which means that we neglected all the names represented by *et al.*.
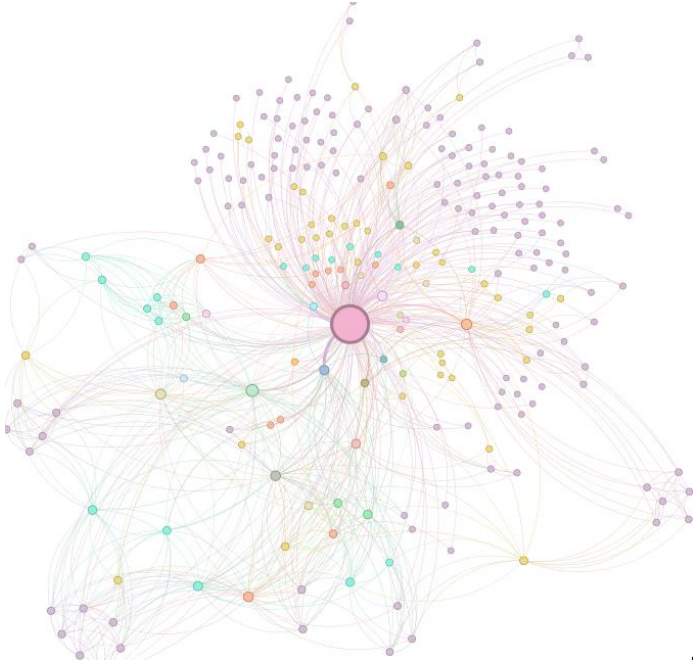
Figure 1. Collaboration network.

Results

i)   *Is there a difference in the market reception between single-authored artworks and collaborative artworks? Is there any difference between types of collaborative works?*

Table 5 presents a summary for the main results of the first research question regarding the impact of collaboration on prices. Model 1.1 shows the main results for our first model specification. Unsurprisingly, compared to singled-authored artworks, collaborative works were on average lower in price, 14.7% specifically, suggesting that the contemporary art market values artworks with single brand names significantly more than the collaborative ones (Radermecker, 2020). An examination of the differences in types of collaboration in Model 1.2 showed shows varying effects of collaboration. All four types of collaboration, except for one which was not significant due to few observations, led to negative prices. For instance, regarding complementary collaboration, compared with works done completely by Zhang Daqian himself, prices dropped about 17.1%. Ideally, artists complement their skills to deliver an artwork that combines their strengths. But the market does not value these works as much, this may be because of their commissioned status for the purpose of meeting social obligations[7] (Wang et al., 2004; Zhu, 2018), making it complicated for consumers to judge the quality of the collaborative artworks.

Table 5. Differences in prices of single-authored works and collaborative works.

Independent variables (dependent variable: logP in 2022 CNY)	Model 1.1. Collaboration dummy.	Model 1.2. Forms of collaboration.
Collaboration	-0.159*** (0.015)	-
Complementary collaboration	-	-0.188*** (0.021)
Commentary collaboration	-	-0.073 (0.078)
Remote collaboration (base: simultaneous collaboration)		
Remote collaboration	-	-0.146*** (0.034)
Unknown	-	0.063* (0.034)
Dedicated collaboration	-	-0.055*** (0.01)

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[7] 应酬之作 *yingchou zhizuo*

Artist's name dummies	excl.	excl.
Other hedonic variables	incl.	incl.
Total observations	9,838	9,838
R-Square	0.380	0.380
Adj. *R*-Square	0.375	0.374

Robust standard errors in parentheses.
*** p<.01, ** p<.05, * p<.1

> *ii)* *Do the names of the collaborators influence the prices of collaborative artworks? What are the effects of the position of names and number of names?*

In Table 6, we summarize findings for our second research question where we test for the impacts of the numbers of artist's names and the position of Zhang Daqian's name (Model 2.1), as well as the differences in prices for different collaborators (Model 2.2).

Table 6. Impacts of collaborator's names.

Independent variables (dependent variable: logP in 2022 CNY)	Model 2.1. Number of artist's names and the position of Zhang Daqian's name.	Model 2.2. Artist's name dummies.
Number of extra names	-0.058*** (0.01)	-
Position of Zhang Daqian's name (base: first)		
Middle	0.12 (0.117)	-
Last	-0.081*** (0.022)	-
Artist's names (base: Zhang Daqian)		
Zhang Daqian and Huang Junbi	-	-0.31*** (0.079)
Zhang Daqian and Pu Ru	-	-0.087** (0.038)
Zhang Daqian and Qi Baishi	-	0.206*** (0.053)
Zhang Daqian and Shen Yinmo	-	-0.033 (0.085)
Zhang Daqian and Wu Hufan	-	-0.136*** (0.051)
Zhang Daqian and Xie Zhiliu	-	-0.262*** (0.078)
Zhang Daqian and Ye Gongchuo	-	-0.131 (0.09)
Zhang Daqian and Yu Feian	-	0.016 (0.042)
Zhang Daqian and Yu Youren	-	-0.377** (0.152)
Zhang Daqian and Zhang Shanzi	-	-0.184*** (0.036)
Other collaboration sets	-	-0.191*** (0.021)
Artist's name dummies	incl.	excl.
Collaboration dummy	excl.	excl.
Other hedonic variables	incl.	incl.
Total observations	9,838	9,838
R-Square	0.378	0.383
Adj. *R*-Square	0.373	0.377

Robust standard errors in parentheses.
*** p<.01, ** p<.05, * p<.1

Model 2.1 shows that, as the number of collaborators increased, the prices decreased by roughly 5.6%. Meanwhile, compared with when Zhang Daqian's name was placed at the first position, when his name was at last position, the prices were 7.8% lower.

Unsurprisingly, when it comes to the effects of artist's names (Model 2.2), most of the selected artist names were associated with negative prices. For instance, the prices for collaborative works done by Zhang Daqian and Yu Youren were on average 31.4% less than works by Zhang Daqian only—this was also the pair with the most price decline. A few exceptions of collaborator's names emerged as the more successful collaborations than the others which led to a drop in prices: Qi Baishi was linked to a positive price impact of 19.9%, whereas Shen Yinmo, Ye Gongqiu, Yu Feiyan had no significant price impact. This is not surprising because according to Wang et al. (2004), the prices for collaborative paintings also largely depend on who the artists are.

   iii)   *Does the network centrality of collaborators play a role in the prices of collaborative artworks?*

In Model 3.1-3.3, we examine how network centrality affected prices of collaborative artworks (Table 7). Compared to the revised baseline model for collaborative works, all the centrality measures showed statistically significant positive effects on prices, following a concave function. This meant that network centrality measures positively predict prices, although only up to a certain point. For most collaborators, network centrality related to creative success almost in a linear-positive manner, suggesting that the more well-connected one collaborator was, the better the collaborative artwork would be appreciated by the market.

Table 7. Impacts of network centrality measures.

Independent variables (dependent variable: logP in 2022 CNY)	Model 3.1. Degree centrality.	Model 3.2. Eigenvector centrality.	Model 3.3. Closeness centrality.
Degree centrality	0.00987*** (0.00292)	-	-
Degree centrality^2	-0.000196*** (0.0000653)	-	-
Eigenvector centrality	-	1.414*** (0.448)	-
Eigenvector centrality^2	-	-2.826*** (1.044)	-
Closeness centrality	-	-	103.599* (53.313)
Closeness centrality^2	-	-	-97.646*(50.754)
Artist's name dummies	excl.	excl.	excl.
Collaboration dummy	excl.	excl.	excl.
Other hedonic variables	incl.	incl.	incl.
Total observations	534	534	534
R-Square	0.344	0.344	0.333
Adj. *R*-Square	0.246	0.247	0.234

iv) Is there a difference in the prices of collaborative artworks in different stages of the artist's career?

Table 8 presents our main findings for the impact of collaboration on prices cross stages of Zhang Daqian's career. Clearly, not only were there differences in prices among career stages, but the negative effect of collaboration was also mediated by the career stages. Results from the Model 3.1 show that the reduction in average art prices due to collaboration for Stage A was 7.3%. Further down the career stages, the extents of price decreases became more severe: in stage B the average price for collaborative works of Zhang Daqian was 25.3% lower than his own works, and in stage C, the figure was 34.8%. This may be suggesting that the further the artist was in his artistic career, the more people tended to expect him to be original and creative.

Table 8. Stages of the artist's career and collaboration.

Independent variables (dependent variable: logP in 2022 CNY)	Model 4.1. Interaction between collaboration and stages of career.
Collaboration	-0.076*** (0.023)
Career stage (base: Stage A)	
B	0.129*** (0.013)
C	0.064*** (0.012)
Unknown	0.133* (0.071)
Collaboration × Career stage	
Collaboration × Stage B	-0.198*** (0.042)
Collaboration × Stage C	-0.321*** (0.077)
Collaboration × Unknown	-0.057* (0.03)
Artist's name dummies	excl.
Other hedonic variables	incl.
Total observations	9,838
R-Square	0.388
Adj. *R*-Square	0.383

Conclusion

Collaboration is not uncommon in the art world, only that they are often overlooked. By focusing on an artist genius, we demonstrate how lone artists are not alone. Centering around one of the most eminent artists of history, Zhang Daqian (1899-1983), we glimpse into the social life of an artist representative in the art world of the Republic of China period (1912-1949) by using a unique dataset of Chinese painting and calligraphy artworks (n=9,955) sold in auctions worldwide between 1994 and 2022. We illustrate the diversity of Chinese collaborative paintings with a sub dataset of 675 Zhang Daqian's collaborative artworks and reveal a vast network of collaborators of Zhang Daqian composed of 248 nodes and 782 edges. Applying hedonic regression models and social network analyses (SNA), we shed light on the market reception of both Zhang Daqian's artworks and his collaborative works and provide evidence that: on average, the prices of collaborative artworks were lower than those of the single-authored ones, but not all artist's names had a negative impact on prices; there was an inversely U-shaped relationship between the network centrality of collaborators

and prices; both the number of collaborators and the name position had an impact on prices; the impact of collaboration also varied with the career stages of the artist.

By shedding light on the market reception of collaborative artworks, this study shifted our attention from a single artist to his collaboration network and depicted a broader picture of artistic creation process. In this study, we investigated the collaboration network of Zhang Daqian and illustrated the impact of collaboration and collaborators on art prices. One drawback of this exclusive focus is that we remain ignorant of the networks out of sight, i.e., the collaboration networks of those collaborators, the other networks of Zhang Daqian, and the networks outside of sales records. This limitation, however, must be tempered by the fact that boundary specification problem is common in social network analysis when we must delineate the network we are addressing and assume the social relationships outside the boundary have no effect (Laumann et al., 1989). One way of mitigating the problem would be in a future study to further examine the network of dedicatees by looking at the dedications on the artwork, mapping the people from all walks of life and extending the analysis of the social network Zhang Daqian. At the same time, our study has also shown the importance of the other artist's names on the prices of collaborative artworks and the varying effects. Constrained by space, we did not capture the effect of the reputation of the collaborators, or control for the difference in status with Zhang Daqian when they did the collaboration. Studies have indeed highlighted the vagaries of time and the artist's name as a cultural construct (e.g., Ginsburgh et al., 2019). In addition, the study has pointed us in several promising directions of future research, such as Zhang Daqian as a brand manager, cobranding strategies of artists to exploit brand alliances and constructing brand narratives, marketing strategies of auction houses in promoting collaborative works by manipulating the positions of artist's names, the interaction effect between collaboration across career stages and different artists.

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