RETURNS ON INDIAN ART DURING 2000-2013

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Abstract

The market for modern Indian art is an emerging art market, having come into a proper existence only in the late 1990s. This market saw tremendous growth in its initial years and then a downturn that started around 2007-2008. Using data from auctions conducted by a major Indian art auctioneer, we estimate via hedonic regression a price index for paintings and drawings by Indian artists sold during 2000-2013. We are able to thus estimate a rate of return on Indian art as an investment and also shed light on what drives the price of a painting in the Indian market. In doing so, we document quantitatively the extent of the rise and fall in Indian art prices. We also distinguish empirically two segments in the Indian art market, namely modern painters and contemporary painters, who appear to command different prices at auction. We find a positive and statistically significant relationship between the state of the Indian stock market and art auction prices. Finally, we use our econometric results to construct a ranking of Indian painters in terms of the market prices for their work.
JEL Classification: C20, Z11.
Keywords: art, auction, India, price index, hedonic regression.

1   Introduction

In this paper, we analyze the trend in prices in an important emerging art market: the market for modern Indian art. Although the bulk of the paintings that are currently categorized as modern Indian art were produced between the early 20th century and the 1980s, the name for the category did not come into existence until the late 1990s. Till then, what is now known as modern Indian

art was lumped together with antiquities and folk art in "mixed auctions." With the exception of one auction in 1995, the major auction houses of Christie's and Sotheby's did not have regular auctions entirely devoted to modern Indian art until the early 2000s. However, around 1995 onwards a consensus began to emerge among art critics and historians about modern Indian art being recognized as an independent artistic movement. As a result, during the period 1995-2007 the average price of an Indian art painting at auction increased from $6000 to $44,000 (Khaire and Wadhwani, 2010). Currently Indian art prices are considered roughly comparable to prices for art from Latin America, with several paintings fetching prices in excess of $2 million (USD).

Crucial to the establishment of modern Indian art as a category was the formation in 2000 of the firm Saffronart which devoted itself to conducting auctions of modern Indian art exclusively. We use price data on paintings auctioned by Saffronart during 2000-2013 to document the trend in the Indian market by calculating a price index. Saffronart was the leading auctioneer of Indian artwork during the period 2000-2007 with a market share of at least 41% compared to 25% each for Christie's and Sotheby's (Khaire and Wadhwani, 2010). From November 2000 to June 2013 Saffronart sold around $188 million worth of artwork. The firm is headquartered in Mumbai with additional offices in London, New Delhi, and New York. It conducts several auctions per year and includes a wide variety of Indian artists in its auction catalogue. Being a pioneer in the Indian art market, Saffronart has deep connections within the artistic community, with prestigious Indian art galleries, as well as with art buyers both within India and abroad. This allows the firm access to a great range of authentic and verified artwork to bring to market. The paintings brought to auction by Saffronart are therefore a good representative sample of the Indian art scene.

Our paper represents the first rigorous analysis of price trends in the Indian art market, as well as the effects on it of the global financial and economic crises of 2007-2009. Since art is a heterogenous object, the central challenge in computing a price index for it is to control for the heterogeneity. For instance, if the quality of paintings being brought to a market is falling over time, simply looking at the series of total sales might suggest that art prices are falling, but controlling for the quality of the paintings might suggest otherwise. We use the method of hedonic

2

regression that has been employed previously to study price trends in auctions for Western art work in papers by Anderson (1974), Buelens and Ginsburgh (1993), Barre et al. (1994), Chanel et al. (1994), and Czujack (1997). Mok et al. (1993) study the Chinese art market using the same methodology. The hedonic regression method allows one to compute the price of a "standardized painting" auctioned in any given year. The price of a painting at auction is regressed on time dummies and a set of variables that control for the characteristics of the painting, such as the identity of the painter, their artistic style, the size and medium of the painting, the type of paint used, and so on. Having accounted for the variation in the price of paintings due to their specific characteristics, the estimated time dummies can then be used as a price index that tracks the movements in the price of a standardized painting over time.

Computing a price index for Indian art in this way allows us to document the initial years of an important emerging market. We find a dramatic increase in prices during the period 2001-2006 when our price index, deflated by 2001 prices, grows by 57% every year. This was likely fueled by several factors including genuine growth in demand, a booming Indian economy, as well as growing international interest from long-term collectors and even speculative investors. However, this trend reversed starting around 2007-2008, when art markets crashed all over the world in response to the global financial crisis. We find a consistent decline in prices during the years 2008-2013 at the rate of roughly 18% per year. One potential explanation for this is the decline in the demand for a luxury cultural good like art due to the worldwide recession that affected the Indian economy as well. Another reason was the exit, following the recession, of international hot money and speculative buying that might have fueled some of the meteoric rise in prices in the Indian and other art markets. Overall, even though some of the initial gains in the price index were reversed post-2007, prices in 2013 still represented an annual real rate of increase of about 11% per year during 2001-2013. Art market analysts expect that as the Indian and world economies recover, and buying in some segments of the market becomes more deliberate and less speculative, Indian art prices might stabilize at reasonable levels in the coming years.

Art historians typically have categorized Indian painters into two stylistic groups: modern

and contemporary painters, although the work of both groups is termed modern Indian art. The modern painters represent the older and more established set of artists. We find that in the time period under consideration, the price index for modern painters suggests an annualized real rate of return of roughly 12% while the index for contemporary artists yields 7.5%. We also document a statistically significant difference in the average auction prices for these two segments (higher for modern). Thus, we are able to establish quantitatively that modern and contemporary painters represent distinct segments in the Indian art market. We further explore differences in the market valuation of individual artists. A regression specification with artist fixed effects is employed and the estimated artist fixed effect coefficients are used to rank Indian painters in terms of the prices commanded by their work at auction. This exercise allows us to discover which painters are highly valued in this emerging art market. Chanel et al. (1994) generated a similar ranking for Western artists.

Our econometric analysis allows us to illuminate the different determinants of the price of Indian art both over time as well as across heterogeneous artwork. In addition to the usual explanatory variables, we discover a positive and statistically significant relationship between the Indian stock market and art auction prices. More broadly, our paper contributes to the research program on understanding the prices realized at art auctions all over the world. Ashenfelter and Graddy (2006) present a detailed survey of this literature. They emphasize that understanding the trend in art prices using an index is useful in determining the profitability of buying art as an investment strategy. The rate of increase of the price index can be taken to be a rate of return on holding art, which can then be compared to the rate of return on other assets in order to determine whether art should be part of an investor's portfolio. Different studies have found that the return on art tends to vary wildly in the short run, which is consistent with the results that we find. However, the longer run rates of return are often not too different from other financial assets like stocks and bonds. Rates of return in the range of 2.5-5% have been estimated by various studies cited in Ashenfelter and Graddy (2006). The rate of return that we have estimated for the Indian market is higher than this, although given the downward trajectory of prices, we wonder if prices will

settle down at levels that offer rates of return comparable to what other studies have found.

We are the first to study the Indian art market using econometric techniques and want to emphasize that it is important to understand the trends in this market. India is a country with 1.2 billion people and by 2050 will become the most populous nation in the world, surpassing China. A country's art is an expression of the broader socio-economic and political trends that shape the life of its citizens. It is hard to overestimate the value of art and the creativity it represents, which in turn must be representative of a larger innovative force in a nation. Looking at the developed world there is a clear correlation between economic development and a thriving art market. The dramatic trends in China's art market for instance have been taken as yet another signal of its growing economic dominance. The price of art therefore conveys important information about the demand as well as supply of a very important cultural good. To date there has been no rigorous econometric analysis of the long-term price trend in the Indian art market and our paper fills this gap.[1] Current market analysts typically use a simple average of sale prices, without controlling for characteristics to standardize the paintings. By controlling for painting and painter characteristics we are able to offer a nuanced understanding of what drives the prices of modern Indian artwork.

We describe the data from Saffronart in the next section. Section 3 presents our econometric findings in the form of regression output, price indices and painter rankings, while Section 4 offers concluding remarks.

2   Data from Saffronart

Our dataset consists of paintings and drawings by Indian artists that were sold at auctions conducted by Saffronart during 2000-2013. The average painting sold for $47,617 and the total value of the sold paintings is about $170 million.[2] About 60% of Saffronart's buyers are based in India. Of the remaining 40% non-resident Indians (NRIs) constitute the bulk. Buyers can pay in either

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[1]We do want to mention the work of Reddy and Dass (2006) who focus on a single Saffronart auction in December 2004 for 107 paintings to understand within-auction price dynamics. Their work is complementary to ours since we focus on trends in auction prices over time.

[2]We consider paintings by frequently auctioned artists only and exclude some unusual auctions. More details below.

Indian rupees (INR) or US dollars (USD); we present the figures in dollars. The highest winning bid in our data was $2.22 million for the painting *Wish Dream* by artist Arpita Singh.

As noted above, Saffronart has been in operation since 2000 and currently has offices in India, the US, and the UK. Although it initially conducted one or two major auctions a year, the firm now regularly conducts four major auctions annually (spring, summer, fall, and winter). The average number of paintings auctioned off at a typical auction in our data is 105. There are two novel features to the way Saffronart auctions work: the auctions are conducted online, and the auctions for all objects begin simultaneously. Interested bidders can log on to Saffronart's website (www.saffronart.com) and place a bid for the paintings they are interested in.[3] This can be done via a computer or through a tablet or smartphone application. Only registered bidders with pre-approved bidding limits are allowed to bid in the auction. Prior to the auction date Saffronart conducts preview exhibitions of the paintings in cities like London, New York, and Mumbai, where potential bidders can physically examine the paintings. Additionally at the time of bidding each auction webpage contains a high-resolution image of the artwork. Figure 1 provides an example of an auction in progress. A typical auction period lasts for about a day and a half and the 105 paintings are divided into three "closing groups" of 35 paintings each. The auctions for all the paintings start simultaneously but the auctions in the first closing group end first, after about 36 hours, followed thirty minutes later by auctions in the second closing group, followed thirty minutes later by auctions in the final closing group. Each artwork has a secret reserve price and if the highest bid does not exceed it the painting goes unsold. Saffronart posts a low and high estimated price for each painting and it is understood that the secret reserve price does not exceed the low estimate. The auctions are similar to those conducted by eBay.com in the sense that it is an open ascending format. Bidders can submit bids as often as they want before the closing of the auction, and all submitted bids are visible to all the bidders.[4] A bidder can also submit a proxy

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[3]Online auctions are a growing trend in the art world and several international art auction houses have experimented with this format in recent years (Gameran and Crow, 2011).

[4]The deadline for bidding on a lot gets extended by two minutes if a bid is placed in the last two minutes of the auction. After this, every time a new bid arrives, the countdown clock is reset for two minutes. The auction closes when no new bids are received in a two-minute interval after the previous deadline is passed.

Figure 1: An auction in progress

bid in which case the software automatically bids the minimum increment on behalf of the bidder as long as the highest bid by the other bidders is below the proxy bid.

While Saffronart publishes the winning bids, it does not reveal bid histories in general. Reddy and Dass (2006) were able to get access to the bids for one Saffronart auction during 2004 and present several interesting details. There were 127 unique bidders for 107 paintings. The number of bidders (bids) on a painting ranged from 2 (2) to 8 (23) with an average of 4.06 (9.5). In another auction during December 2005, a reported 299 bidders submitted bids.

In addition to the four major art auctions which feature the work of established mainstream painters, Saffronart also conducts several "24-Hour Absolute Auctions" every year. While otherwise similar to the major auctions, these auctions usually contain art objects that are either the minor works of major names or works by less well-known artists. The major novelty of these auctions is that they do not have reserve prices and the object is always sold to the bidder with the highest bid. The mean winning bid within absolute auctions is $6504, although 10% of the

paintings sell for more than $10,000, with the highest observed winning bid of $184,000.

While a major Saffronart auction will mostly sell paintings and drawings, the absolute auctions can sometimes have other artworks in the form of prints, photographs, sculpture, ceramics, digital art, calligraphy and books. These diverse types of art objects vary in average value, demand, and supply. Therefore we focus only on paintings and drawings (described henceforth as paintings), which anyways account for the bulk of art sold by Saffronart. While Saffronart specializes in Indian art, they conducted one auction of Western Impressionist art that included the works of artists like Vincent van Gogh, Pablo Picasso, Henri Matisse, Salvador Dali, and so on. We do not include this auction in our data in order to focus on Indian artists. Additionally we omit a charity auction conducted by Saffronart since that auction might have attracted a different set of bidders than the usual auctions. Given these restrictions, about 76% of the 5514 paintings we observe brought to auction are sold successfully; we use the data from these sales to estimate our price index. Occasionally some of the unsold lots are sold privately after auction, but we do not have information on the prices for these transactions, and we consider them as unsold at auction (97 paintings). We further restrict our data to sold paintings from artists who sold 15 or more paintings during 2000-2013, which covers 74 artists well-represented in the dataset. This list includes most major names in Indian art as well as many lesser known painters. Restricting our data in this manner leaves us with 3572 paintings that were successfully sold during November 2000 to June 2013.

Indian painters are often thought of by art historians as consisting of two distinct stylistic groups: *modern* and *contemporary*. Modern artist is a term that usually denotes painters born before or around 1940 (India became an independent country in 1947) and includes artists like M.F. Husain, S.H. Raza, F.N. Souza, V.S. Gaitonde, Ram Kumar, Tyeb Mehta, Jogen Chowdhury, and others. The term contemporary typically denotes artists born after 1940; some important names are Atul Dodiya, Subodh Gupta, Jitish Kallat, Anju Dodiya, and Shibu Natesan. Of the 72 artists that sell more than 15 paintings, 36 happen to be modern painters and 36 are contemporary painters. Table 1 details statistics for winning bids by auction type (major or absolute) and artist

type (modern or contemporary). Major auctions constitute the bulk of the data, with absolute auctions accounting for about 16% of the recorded sales. Modern painters have the larger market share and within themselves account for 2447 sales, with the average painting selling for $53,114. The contemporary group on the other hand accounts for 1125 sold paintings with an average price of $35,660. Modern painters clearly command higher prices than contemporary painters and this difference is statistically significant ($p = 0.0000$). In our results section we further analyze trends within each of the two groups of artists. For each of the 3572 sold paintings we have the following

Table 1: Summary Statistics: Winning Bids by Auction and Artist Types

	mean	std. dev.	min	max	obs.
All Auctions	47,616.58	109,071.40	231.00	2,223,744.00	3572
Modern	53,113.57	119,023.00	231.00	2,223,744.00	2447
Contemporary	35,660.02	82,210.68	240.00	1,427,500.00	1125
Major Auctions	55,933.26	117,702.70	275.00	2,223,744.00	2971
Modern	62,222.39	128,144.70	275.00	2,223,744.00	2045
Contemporary	42,044.19	88,970.20	350.00	1,427,500.00	926
Absolute Auctions	6,503.69	13,848.99	231.00	184,000.00	601
Modern	6,776.42	11,572.96	231.00	100,690.00	402
Contemporary	5,952.75	17,592.33	240.00	184,000.00	199

Note: all numbers are in nominal USD.

data: title of painting, name of painter, winning bid amount in USD and INR, and the low and high price estimate. Additionally we know the following characteristics for each painting: type of paint (e.g. oil, watercolor, ink), surface medium (e.g. canvas, paper, cardboard), height and width in inches, category (painting or drawing), style (e.g. figurative, abstract, landscape), and whether the painting is signed and/or dated. Some paintings had multiple pieces, and for these we used the average height, width and so on. Finally, we know the date of painting for 2949 of the paintings in our restricted sample. In Table 2 we present summary statistics on these as well as some additional variables. The *dead* variable takes value 1 if the painter is dead and 0 if they are alive. To measure the uncertainty regarding the valuation of a painting by the auctioneer, we divide the spread of the estimate (defined as high estimate minus low estimate) by the estimate (defined as the average of the low and high estimate) and take its log to arrive at *log(spread/estimate)*. The larger this

ratio is the less certain the auctioneer (and the market) is likely to be regarding the value of the painting. The *signed* dummy takes the value 1 if the painting is signed and 0 otherwise. Finally, we include the log of the value of the stock index of the Mumbai stock exchange on the day of the auction *log(stockindex)* as a variable of interest in our data.

Table 2: Summary Statistics: Control Variables

	mean	std. dev.	min	max	obs.
Winning bid (USD)	47,616.58	109,071.40	231.00	2,223,744.00	3572
(real USD)	39,003.38	88,754.79	173.30	1,755,748.00	3572
(real INR)	1,399,640.00	3,189,326.00	2,421.30	53,800,000.00	3572
Low estimate (USD)	24,267.55	57,573.96	210.00	1,468,927.00	3572
(real USD)	29,817.27	71,920.21	280.00	1,860,470.00	3572
(real INR)	851,754.50	1,952,491.00	6,034.00	43,800,000.00	3572
High estimate (USD)	38,084.47	95,043.32	345.00	2,325,585.00	3572
(real USD)	30,957.11	75,957.13	264.00	1,836,157.00	3572
(real INR)	1,088,882.00	2,587,826.00	7,542.00	54,700,000.00	3572
log (Spread/Estimate)	-1.46	0.34	-2.93	0.68	3572
Height (inches)	29.81	19.46	(blank)	287.00	3572
Width (inches)	30.75	24.55	(blank)	341.00	3572
Signed	0.92	0.28	0.00	1.00	3572
Date painted (modern)	1986	18.18	1941	2013	1956
Date painted (contemporary)	2003	4.96	1975	2012	993
Dead	0.31	0.46	0.00	1.00	3572
log (StockIndex)	8.95	0.37	7.88	9.59	3572

Note: real prices are in 2001 dollars or 2001 rupees.

3   Regression Results

We are interested in understanding the trend in the prices for Indian paintings sold at auction during 2000-2013. The central challenge in doing so is due to the fact the paintings are heterogenous objects. Like cars and houses, paintings are hedonic goods in that a buyer's willingness to pay for the good depends on the characteristics it possesses. For a painting, these characteristics could include the identity of the painter, artistic style, size, medium, type of paint and so on. Thus, part of the variation in the prices of the paintings in our dataset is due to variation in their characteristics, while the other part could be due to marketwide shifts in demand and supply. Following Chanel et al. (1994) we decompose the price of a painting using the following hedonic

regression:

$$\ln p_{kt} = \gamma + \beta_t + \sum_{i=1}^{m} \alpha_i x_{i,kt} + \varepsilon_{kt}. \qquad (1)$$

Here p_{kt} is the price of painting k sold in year t, and β_t are year-dummies. The term $x_{i,kt}$ denotes the i-th characteristic of painting k sold in year t. The coefficient α_i can then be thought of as an implied market price of characteristic i. We assume that the valuation of the i-th characteristic does not change over time, which is appropriate considering the time period under consideration in our paper. However, time-dependent αs can be estimated when one has a larger dataset and changes in tastes might be expected over time (see Buelens and Ginsburgh (1993) for an application).

Using (1), we can think of β_t as the price of a standardized painting in year t, with the $\sum_{i=1}^{m} \alpha_i x_{i,kt}$ term explaining the deviation of p_{kt} from β_t due to the specific characteristics of the painting. The sequence $\beta_{2000}, \beta_{2001}, ..., \beta_{2013}$ then gives us a price index, which allows us to examine the marketwide trend in prices for Indian art while controlling for heterogeneity among the paintings that are being auctioned.

Given our price index the annual rate of return on paintings in period t can be approximated by $\frac{\beta_t - \beta_{t-1}}{\beta_{t-1}} \times 100$. For art markets with longer histories of prices an alternative approach to estimating the rate of return on art is possible, namely the repeat-sales method that has been employed by Baumol (1986), Buelens and Ginsburgh (1993), and Mei and Moses (2002). The idea there is to look only at paintings that are sold multiple times in the dataset, tracking the change in price between the successive sales of a painting. An annualized rate of return can then be inferred between any two time periods by averaging the annual return on paintings that were sold before as well as after the period under consideration. The repeat-sales method is useful when there are sufficient repeat sales in the data which is not the case for us. Moreover, using the hedonic goods method allows us to use information on all paintings sold, and not just the paintings sold multiple times. Given the growth in the Indian art market as well as growing availability of data on it, the computation of a repeat-sales price index might be feasible with another ten years worth of data. For further discussion we point the reader to Ashenfelter and Graddy (2006) who survey the general literature on estimation of different price indices for art data, and to Ginsburgh et al. (2006) who

present a careful analysis of the relative merits of hedonic regression and the repeat-sales method.

In Table 3 we present estimates from the hedonic regression, first using sales at all auctions, and then using sales only at major auctions. Within these categories we run regressions using (1) all paintings, (2) only paintings by modern painters and (3) only paintings by contemporary painters. This allows us to compute separate price indices for modern and contemporary painters as well as the set of all painters. The dependent variable in all regressions is the log of the price of a sold painting in Indian rupees (INR) deflated by 2001 price levels.[5] This is regressed on several explanatory variables. We have already discussed *height*, *width*, *signed*, *log(spread/estimate)*, and the *dead* dummy variable. In addition, there are *time* dummies, one for each year during 2001-2013, with 2000 as the omitted year. The sequence of these dummies constitutes our price index. Since a painting date is not available for every sale, *dateknown* takes value 1 if the date the painting was painted is known. Additionally, the *dateknown* × *datepainted* variable interacts date known with painting date and its coefficient tells us how the value of a standardized painting with a known painting date changes with the date it was painted. This allows us to account for the price effects of different artistic movements in Indian art history. The *painting* dummy takes the value 1 if the artwork is a painting and 0 if it is a drawing. There are 13 *medium* dummies with the omitted medium being the category that collects all rare media (that occurred less than 10 times in the data or were unreported). There are four *style* dummies with unreported acting as the omitted category. There are 73 *artist* dummies with Phaneendra Nath Chaturvedi as the omitted artist. The estimated coefficients for the *artist*, *medium*, *style*, and *time* dummies are omitted from the regression results.[6]

The estimates reveal several interesting features of price determination at these auctions. The price of a painting is decreasing in the spread/estimate ratio. This suggests that buyers might be taking a greater spread on a painting's estimate as a signal of greater uncertainty regarding its valuation and bidding lower as a result on account of risk aversion. The size of the estimated

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[5]We chose INR for the regressions since the majority of Saffronart's buyers are either based in India or have substantial financial assets located there.

[6]The *time* dummies (β_t) are presented later on in Table 4.

Table 3: Hedonic Regression of ln(winning bid in 2001 INR)

	all auctions			major auctions		
	(all artists)	(modern)	(contemp)	(all artists)	(modern)	(contemp)
ln(Spread/Estimate)	-0.171***	-0.180***	-0.171**	-0.0953*	-0.0984*	-0.167*
	(-4.73)	(-4.36)	(-2.76)	(-2.50)	(-2.35)	(-2.33)
Height	0.0209***	0.0239***	0.0151***	0.0191***	0.0220***	0.0134***
	(-23.08)	(-18.30)	(-13.05)	(-19.96)	(-17.07)	(-10.37)
Width	0.0112***	0.0179***	0.00902***	0.0121***	0.0174***	0.00960***
	(-15.52)	(-14.99)	(-10.77)	(-14.82)	(-14.82)	(-9.19)
Signed	0.0275	0.116*	-0.0895	-0.0026	0.0897	-0.083
	(-0.58)	(-2.01)	(-1.21)	(-0.05)	(-1.50)	(-0.93)
DateKnown	6.897***	8.331***	-25.24**	5.264*	6.772**	-20.25
	(-3.33)	(-4.02)	(-2.61)	(-2.41)	(-3.16)	(-1.83)
DateKnown $\times$ DatePainted	-0.00341**	-0.00416***	0.0127**	-0.00261*	-0.00340**	0.0102
	(-3.28)	(-3.99)	(-2.62)	(-2.37)	(-3.16)	(-1.84)
Painting	0.708***	0.625***	0.127	0.704***	0.592***	-0.201
	(-15.55)	(-13.69)	(-0.59)	(-11.99)	(-10.49)	(-0.35)
Dead	2.179***	1.109***	0	0.908***	0.907***	0
	(-10.30)	(-7.48)	(.)	(-5.74)	(-5.95)	(.)
Constant	8.477***	9.356***	9.274***	10.08***	9.924***	9.716***
	(-35.63)	(-49.13)	(-20.77)	(-46.68)	(-45.08)	(-11.12)
N	3572	2447	1125	2767	1988	779
adj. R-squared	0.841	0.855	0.86	0.817	0.845	0.82

Note: t-statistics in parentheses. All regressions include Artist, Medium, Style, and Time (β_t) dummies.

coefficient for this variable is smaller and less statistically significant in the case of major auctions where the artworks tend be well-known or from simply more established painters.

Controlling for other factors, larger paintings command higher prices, which is consistent with other studies. Whether a painting is signed or not does not appear to affect its price in a statistically significant manner. The effect of painting date varies for modern and contemporary painters. Older paintings by modern painters sell for higher prices (see the sign of *dateknown × paintdate*). For contemporary artists, all of whom are still alive and many at the peak of their careers, newer paintings sell for higher prices (although this is not statistically significant in the case of sales at only major auctions). The *painting* dummy is statistically significant and positive for modern painters suggesting that, controlling for the other characteristics, an artwork by a modern artist is more valued when it is a painting than a drawing. The sign of the *dead* dummy suggests either higher demand or lower supply of paintings by dead painters which leads to higher prices. This coefficient is estimated only for modern painters since all the contemporary painters in our dataset are still alive. Overall we are able to account for around 82-86% of the variation in the data.[7]

3.1 A Price Index for Indian Art

Given the extensive set of control variables in our regression in Table 3, the estimated time dummies β_t can now be used to construct a price index that tracks changes in the price of a standardized painting over time. We present in Table 4 an index for the entire market as well as the modern and contemporary segments separately. Within each of these three categories we also present the index for the group of paintings sold only at the major auctions. With 2000 being the omitted year, we have normalized $\beta_{2001} = 100$. We also depict the price indices graphically, in Figures 2, 3, and 4.

Looking first at all paintings in all auctions (Figure 2), prices rose precipitously from 2001-2006 at an annualized growth rate of 57% per year. Prices then seem to have stabilized relatively till 2008. In addition to genuine growth in demand, part of the meteoric rise in prices is explained by

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[7]Even if we omit the painter fixed effects we are able to explain 61% of the variation.

Table 4: Real Price Index using estimated β_t from hedonic regression

|	all auctions			major auctions		
	(all artists)	(modern)	(contemp)	(all artists)	(modern)	(contemp)
β_{2001}	100.00	100.00	100.00	100.00	100.00	100.00
β_{2002}	168.19	195.65	102.85	149.38	169.93	96.61
β_{2003}	262.55	279.96	174.48	229.67	241.19	162.35
β_{2004}	449.93	475.89	316.28	377.08	391.12	284.24
β_{2005}	736.13	774.73	536.14	592.24	611.76	454.41
β_{2006}	945.03	972.79	711.58	758.24	761.30	613.36
β_{2007}	891.66	876.59	703.05	707.43	684.17	600.55
β_{2008}	949.73	865.16	755.87	755.63	686.94	649.80
β_{2009}	659.03	666.79	513.49	535.40	530.62	445.39
β_{2010}	655.66	650.45	537.54	532.84	517.96	472.05
β_{2011}	494.21	524.45	387.50	463.75	468.25	419.66
β_{2012}	393.96	430.26	251.17	438.25	444.70	318.86
β_{2013}	355.62	382.69	239.56	383.80	386.07	321.86
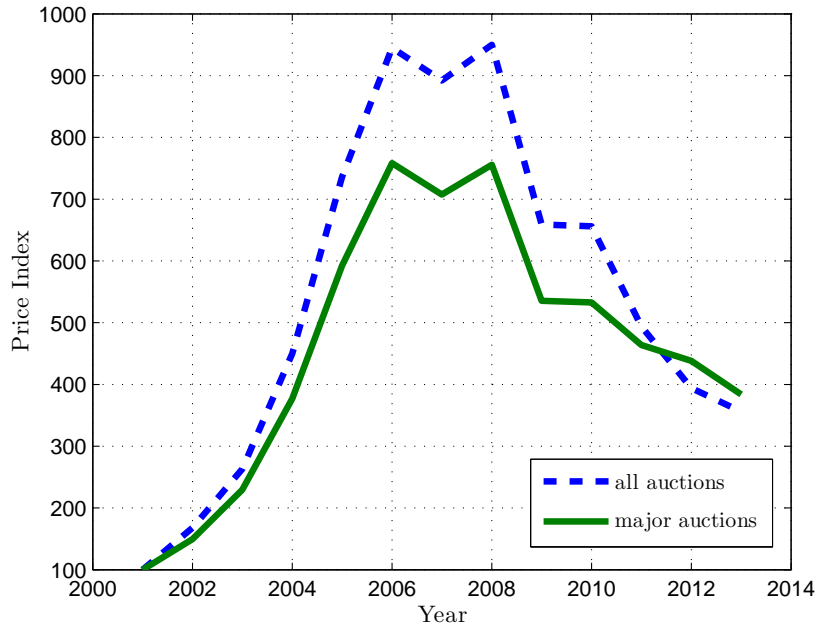
Figure 2: Real price index for all painters
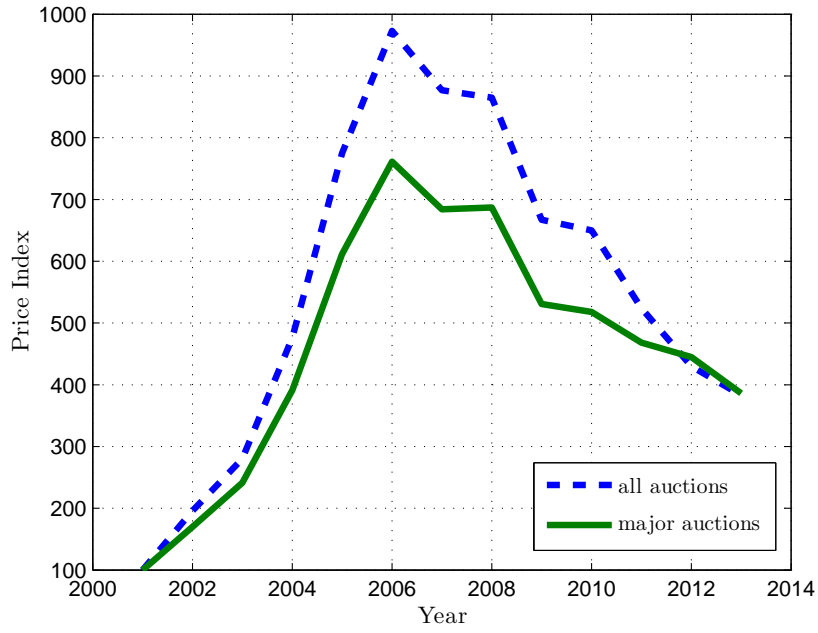
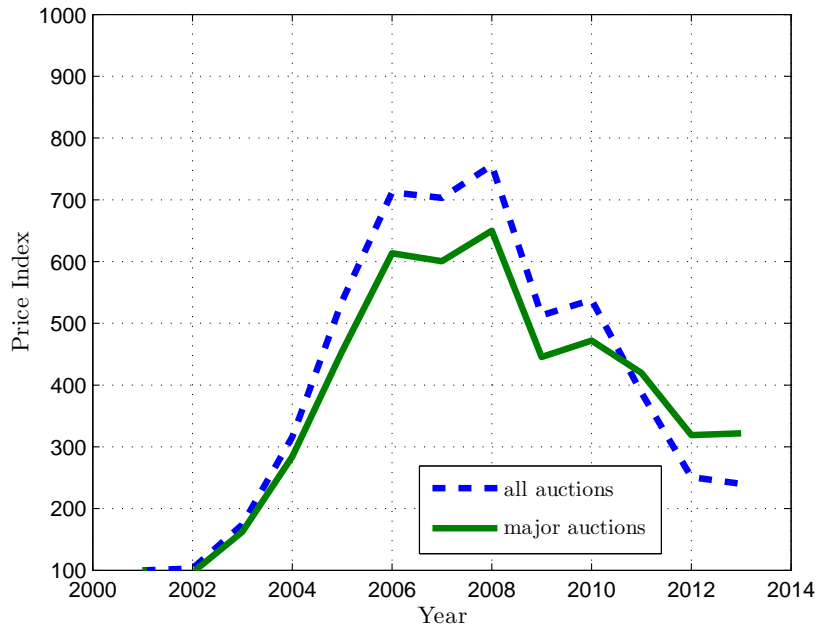Figure 3: Real price index for modern painters

Figure 4: Real price index for contemporary painters

what art market analysts have called hot money, being spent by speculative investors and global art funds. This money quickly vanished from the market around 2007-2008 when the global financial crisis occurred, originating from the subprime mortgage crisis in the US. The Indian financial sector is not very tightly interlinked with global financial markets, and as a result, the global financial crisis of 2007-2008 largely left the Indian financial markets unaffected. However, once the financial crisis turned into a global recession it affected the Indian economy as well (Kumar and Vashisht, 2012). During 2008-2009 the Indian GDP growth rate fell by two percentage points and the Mumbai stock exchange index crashed several times. As a result of global and national economic distress Indian art prices appear to have collapsed as well. Starting in the year 2008 our price index declines steeply, falling at an annual rate of about 18% during 2008-2013. Part of this decline is likely due to reduced demand for art in tough economic times but part of it is also due to the sudden exit of global and local speculative investors from the Indian art market. That said, over the entire time period 2001-2013 our price index suggests an annual real rate of return of about 11% which is an economically significant rate of return on investments in Indian art.

Next, we look at trends in the market for paintings by modern painters (Figure 3). These painters represent the more established set of painters in the market, with a more stable existing stock of paintings as many of these painters have died or are at the end of their careers. Looking at all the auctions (including absolute auctions), prices grew at roughly 58% every year during 2001-2006 and declined thereafter for the rest of the time period under consideration, falling at an average of 12.5% every year. The average annual growth in real prices for these paintings over 2001-2013 was about 12%.

The contemporary painters group is a market segment that is very much in flux, with contemporary painters still producing many important artworks. This is also a market where there is great scope for speculation as it is not clear which artists or artworks will stand the test of time. In fact corresponding to the Indian boom and bust in art prices was a corresponding boom and bust (in 2008) in prices for Western art which is believed by some to have been fueled by speculative buying of contemporary art (Peers, 2008; Gameran and Crow, 2011). At around the same time,

an even more dramatic boom and bust occurred in the Chinese contemporary art market (Ford, 2009; Robertson, 2011). Our index for all contemporary auctions in Figure 4 suggests that prices kept increasing in the Indian contemporary segment longer than in the modern segment (where the decline began two years earlier in 2006), reaching a peak in 2008. Prices for contemporary paintings grew at an average real annual rate of about 33.5% during 2001-2008. The crash in this segment was more intense than the modern painters segment, with prices falling at an annual real rate of 20.5% during 2008-2013. This is likely due to prices during 2001-2008 being less connected to the fundamental value of paintings and more to speculative interest in a risky asset. Once the speculative investors left, prices fell precipitously. The average real rate of return on contemporary art during 2001-2013 has been 7.5%. Thus modern painters appear to have offered a better rate of return than contemporary painters.

Focussing now on price trends in the major auctions conducted by Saffronart, note in Figure 2 that for most of the years the price index for major auctions remained below that for all the auctions. The index for major auctions grew and fell less intensely than the one for all auctions. Since the value of art in the major auctions is likely to have been better understood compared to pieces brought for sale in the absolute auctions, it is possible that some of the difference is explained by more speculative activity for lesser known and less well-understood artwork in the absolute auctions. However, around 2011-2012 the two indices appear to be converging. This could be due to greater deliberation being exercised by buyers in this market following the 2008 crash. The rates of return described in the previous paragraphs are for all auctions. Looking only at major auctions, the annualized rates of return for modern, contemporary and all painters are 11.9%, 10.2%, and 11.8% respectively. These are similar to the rates of return using all auctions except for the contemporary paintings which yielded a return of 7.5% based on all auctions. It appears therefore that contemporary paintings being sold in the major auctions are holding onto their pre-2008 gains better than contemporary paintings in the absolute auctions. This could mean that buyers of contemporary paintings in absolute auctions are bidding more cautiously relative to those bidding on contemporary work in major auctions, which are more likely to feature more

established painters and pieces.

While there has been no rigorous analysis of the Indian art market other than our paper, there has been anecdotal commentary by art market analysts who have typically tracked the total value of paintings sold without controlling for painting characteristics. It is believed that 2007-2008 marked the peak of the Indian market and that the market has been falling since, with some recent trend towards stabilization. Thus, our findings are consistent with the folk wisdom in this market.

3.2   Stock Market and Art Prices

Anecdotal commentary by art analysts suggests that the state of the stock market might affect the enthusiasm of buyers at art auctions. Moreover, stocks are an alternative class of assets that an investor in art might also invest in. Therefore it is an interesting exercise to include an index of the stock market as an explanatory variable in the regression. A note of caution should be made here though. Since the stock market and art prices could both be reacting to common events it is not clear whether the stock market index is appropriate as an exogenous variable. However, Chanel et al. (1994) do point out that in general stock markets have been found to 'cause' art prices. In Table 5 we report estimates from a hedonic regression like the one in Table 3 except that here the time dummies have been replaced with the log of the Mumbai stock exchange index.

We find that the coefficient on ln(StockIndex) is positive, large, and statistically significant: a healthier stock market is associated with higher art auction prices. Compared to the modern segment, the coefficient is about 50% larger for the contemporary segment of the market. This fact is consistent with the hypothesis that bidding for contemporary paintings might be less connected to the long-term value and artistic merit of the paintings and more a function of a general speculative mood that gets heightened when the stock market soars and is dampened when the stock market crashes.

Table 5: The Stock Market and Art Prices

	all auctions			major auctions		
	(all artists)	(modern)	(contemp)	(all artists)	(modern)	(contemp)
ln(Spread/Estimate)	-0.730***	-0.688***	-0.829***	-0.438***	-0.475***	-0.374***
	(-17.95)	(-15.07)	(-10.61)	(-10.94)	(-10.50)	(-5.06)
Height	0.0224***	0.0253***	0.0171***	0.0192***	0.0225***	0.0131***
	(-20.18)	(-15.98)	(-10.91)	(-18.25)	(-14.96)	(-9.52)
Width	0.0129***	0.0198***	0.0107***	0.0115***	0.0171***	0.01000***
	(-14.49)	(-13.71)	(-9.35)	(-13.35)	(-12.48)	-9.73
Signed	0.04	0.06	0.02	(-0.04)	0.02	(-0.12)
	(-0.75)	(-0.80)	(-0.16)	(-0.67)	(-0.28)	(-1.25)
DateKnown	12.12***	13.36***	-0.0751	7.541**	9.018***	-9.068
	(-4.77)	(-5.33)	(-0.01)	(-3.05)	(-3.63)	(-0.75)
DateKnown	-0.00598***	-0.00664***	0.000181	-0.00370**	-0.00446***	0.00463
$\times$ DatePainted	(-4.69)	(-5.27)	(-0.03)	(-2.98)	(-3.57)	(-0.76)
Painting	0.915***	0.789***	0.926**	0.746***	0.602***	0.629
	(-16.58)	(-14.51)	(-3.20)	(-11.35)	(-9.25)	(-0.95)
Dead	1.941***	0.908***	0	1.905***	0.788***	0
	(-7.46)	(-5.05)	(.)	(-7.62)	(-4.41)	(.)
ln(**StockIndex**)	1.372***	1.226***	1.883***	1.457***	1.324***	1.921***
	(-36.52)	(-30.74)	(-21.79)	(-42.54)	(-35.63)	(-26.41)
Constant	-3.688***	-1.330**	-8.422***	-3.084***	-0.970*	-6.698***
	(-8.57)	(-3.27)	(-9.11)	(-7.31)	(-2.41)	(-5.77)
N	3572	2447	1125	2971	2045	926
adj. R-squared	0.758	0.786	0.738	0.752	0.78	0.749

Note: t-statistics in parentheses. All regressions include Artist, Medium, and Style dummies.

3.3 Relative Ranking of Painters

Following Chanel et al. (1994) we use estimates of artist fixed effect dummies to rank the painters in our dataset in terms of the prices commanded by their artwork. The idea is that the coefficient on the artist dummy reflects the value placed by the market on a particular artist being the painter of a work, while controlling for time effects and painting characteristics. Our aim in this exercise is to understand the relative popularity of different Indian painters over the past decade or so. Since some artists' work becomes more valuable after their death, we removed the dead artist dummy from the regression so that the increase in interest in a painter after their death is now attributed to the fixed effect coefficient for them. Moreover, since certain artists became synonymous with particular media or styles we dropped these dummies from the regression as well, in order to avoid attributing an artist's popularity to that for her preferred medium (which might be shared by other lesser known artists). These concerns were less important when we were estimating the price index since we were mostly interested in standardizing a painting's price. In Table 6, we present three rankings: all painters, modern painters, and contemporary painters. For modern painters we normalized the value of the dummies with respect to M.F. Husain. Here, Tyeb Mehta appears to be the top painter in the category by a wide margin, followed by V.S. Gaitonde, and then by S.H. Raza and M.F. Husain. These painters are widely considered to be, along with some others, in the top echelon in the modern category. In the contemporary segment Subodh Gupta followed by Anju Dodiya and Atul Dodiya appear to be the most valued painters in terms of price at auction. While all these painters are understood to be major figures by art historians, our analysis quantitatively confirms the dominance of these artists in terms of auction prices.

Combining both modern and contemporary painters into one basket, Tyeb Mehta again leads the rankings. Some of the rankings of the modern (contemporary) painters change compared to the modern (contemporary) only ranking since now we are using information from paintings by both modern and contemporary painters to estimate the fixed effects. It is interesting that only 3 of the top 25 painters overall are contemporary artists (Anju Dodiya, Subodh Gupta, Atul Dodiya) which underscores the strength of the modern category in the Indian art market.

Table 6: Artist Rankings

Rank	All Artists		Modern Artists		Contemporary Artists	
1	Tyeb Mehta	119.82	Tyeb Mehta	137.89	Subodh Gupta	112.83
2	V S Gaitonde	101.70	V S Gaitonde	108.73	Anju Dodiya	100.84
3	Maqbool Fida Husain	100.00	S H Raza	104.67	Atul Dodiya	100.00
4	S H Raza	99.20	Maqbool Fida Husain	100.00	Surendran Nair	90.04
5	Jehangir Sabavala	92.62	Ganesh Pyne	85.90	Sudhir Patwardhan	82.48
6	Jagdish Swaminathan	89.33	Jehangir Sabavala	84.57	Paresh Maity	75.53
7	Manjit Bawa	88.48	Jagdish Swaminathan	83.35	Nataraj Sharma	73.13
8	Francis Newton Souza	88.44	Francis Newton Souza	83.34	Shibu Natesan	72.24
9	Ganesh Pyne	86.01	Manjit Bawa	80.22	Jayashree Chakravarty	70.00
10	Anjolie Ela Menon	85.56	Anjolie Ela Menon	76.56	Baiju Parthan	68.46
11	Ram Kumar	84.73	Ram Kumar	72.50	Jitish Kallat	68.37
12	N S Bendre	84.48	Jogen Chowdhury	71.80	T V Santhosh	67.21
13	K K Hebbar	83.65	K K Hebbar	70.57	Chittrovanu Mazumdar	64.84
14	Jogen Chowdhury	80.28	N S Bendre	67.98	N S Harsha	62.32
15	Arpita Singh	78.31	Arpita Singh	63.73	Sujata Bajaj	60.55
16	Sakti Burman	77.34	Akbar Padamsee	60.60	A Balasubramaniam	57.64
17	Akbar Padamsee	77.05	Sakti Burman	56.30	Justin Ponmany	54.67
18	Anju Dodiya	75.92	Bhupen Khakhar	52.21	Riyas Komu	53.81
19	Subodh Gupta	75.46	Satish Gujral	51.21	Jagannath Panda	53.57
20	Atul Dodiya	74.43	Krishen Khanna	49.84	G R Iranna	52.17
21	Krishen Khanna	73.80	K G Subramanyan	49.70	Bose Krishnamachari	50.57
22	Satish Gujral	73.73	B. Prabha	47.47	Arpana Caur	48.44
23	B. Prabha	73.61	K H Ara	43.72	Rekha Rodwittiya	48.29
24	Bhupen Khakhar	73.19	Thota Vaikuntam	41.11	Manisha Parekh	43.58
25	K G Subramanyan	71.13	Bikash Bhattacharjee	40.03	Anandajit Ray	40.75

4 Concluding Remarks

The market for modern Indian art is an emerging market since artwork produced by Indian painters was recognized to be part of an independent artistic movement only around 1995. Given that Indian art represents the creative expression of soon-to-be the most populous country in the world, it is a worthwhile exercise to use data on auction prices for artworks by Indian painters to understand the price trends in this important new art market. We used data from Saffronart, a leading auctioneer of Indian art during 2000-2013, to estimate an art price index for this time period. Since paintings are heterogenous objects, we used a hedonic regression to standardize a painting's price by controlling for various painting characteristics. This method, which has been used to study prices for Western art by several researchers, has never been applied to the Indian market. In fact our study represents the first instance of the use of rigorous empirical methods to understand the price trend in the Indian art market, where the analysis so far has remained anecdotal and has ignored the heterogeneity of paintings.

We document a meteoric rise in the prices for Indian art during 2000-2006. Following the global financial crisis and downturn in 2007-2009, art market prices crashed all over the world and the Indian market was no exception. Using the price index we find a dramatic decline in prices since 2008. We also use the price index to compute annualized real rates of return on Indian art which appear to be in the range of 7.5-12.0%. These are high rates of return, but art markets are known to be quite volatile in the short run, and adding future data will likely change these numbers. Given the downward trend in prices, we wonder whether the index will stabilize at levels that generate rates of return consistent with studies of Western art prices over longer horizons. In the paper we distinguish empirically two segments in the Indian art market, namely modern and contemporary painters, and find that modern painters command significantly higher prices than contemporary painters. We also find a positive relationship between the state of the stock market and auction prices, especially in the case of contemporary art. Finally, we generate a ranking of important Indian painters based on the prices commanded by their paintings at Saffronart auctions.

The Indian art market is an important emerging market and much work remains to be done.

While Saffronart sold a large number of paintings by a wide range of Indian artists during 2000-2013, recently Christie's has begun to rival Saffronart as the dominant auctioneer for Indian art. Sotheby's also has begun to make inroads into the Indian market. Adding data on paintings sold by these other two firms will enrich the analysis of price trends for Indian art and we leave this to future work. Saffronart's strategy of holding online auctions allowed it to tap the large market of Indian expatriates living in the US and Europe. Recently however, the firm held its first live auction which resembled a traditional art auction in the sense that one painting is auctioned at a time and most bidders are present in the room placing bids in the presence of a human auctioneer. As data from Saffronart's live auctions accumulates, it would be interesting to analyze whether (and how) the relationship between price and painting characteristics changes with the auction format. Finally, the usual caveats regarding hedonic regression apply. As the Indian market matures and more repeat sales occur in the coming years, it will become feasible to compute a repeat-sales price index which can be compared to our hedonic price index.

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