**REVIEW OF THE LITERATURE**

**ANCHORING**

Anchoring is a cognitive bias that has been studied in psychology and behavioral economics for over 40 years.[[1]](#footnote-1) The seminal work on anchoring was first authored by Tversky & Kahneman (1974), who conducted the experiment described in the introduction.[[2]](#footnote-2) The anchoring effect is extremely complex, and many studies have attempted to understand its nature and implications. For instance, some studies show that people formulate estimates more quickly when provided with numbers to anchor on,[[3]](#footnote-3) while others show that anchoring decreases, but does not altogether vanish, with increased cognitive ability.[[4]](#footnote-4) Other work demonstrates that anchoring is extremely difficult to avoid, even if the anchors are obviously incorrect.[[5]](#footnote-5) A myriad of studies exist on anchoring: for a comprehensive survey of the anchoring literature, see Furnham & Boo (2011).[[6]](#footnote-6)

Within economics generally, various work has been conducted with historical market data by examining prices for unchanging goods with shifting demand to assess potential anchors.[[7]](#footnote-7) Much of the anchoring research in economics uses experiments, surveys, or multiple-choice tests to determine how individuals form estimates and judgments in the presence of an anchor.[[8]](#footnote-9) Anchoring has been studied in many socioeconomic contexts such as accounting,[[9]](#footnote-12) real estate,[[10]](#footnote-13) the courtroom,[[11]](#footnote-14) public goods,[[12]](#footnote-15) and international finance.[[13]](#footnote-16)

In addition, anchoring has been researched in the context of auctions.[[14]](#footnote-17) For example, one bizarre experiment asked students to write down the last two digits of their Social Security number and then bid for various items such as chocolate, computer equipment, or a textbook.[[15]](#footnote-19) The students who had higher digits submitted significantly higher bids, even when explicitly reminded that Social Security numbers are random quantities that carry no inherent meaning. On the other hand, Wolk and Spann (2008), studying bidding in online auctions,[[16]](#footnote-20) found that bidders tend to respond strongly to internalized anchors such as knowledge of past prices for a good, while they respond to external anchors (such as advertiser-suggested bids) just moderately, and only when those numbers are not implausibly high.

**ANCHORING AND ART AUCTIONS**

Anchoring is also present in the art market. The literature shows that first numerical impressions significantly impact prices, auctioneer estimates, and sale volume. Here, we provide an overview of research that studies anchoring in the art market, which is still a highly nascent topic.

To our knowledge, a discussion paper by Beggs & Graddy (2005) is the first to examine anchoring effects (i.e., “reference dependence”) as well as loss aversion[[17]](#footnote-21) in the art auction market. To identify anchoring – which they define as the marginal impact of past price on current price – they first use two datasets of repeat auction sales of Impressionist and Contemporary paintings, including not only hammer price but also hedonic characteristics such as artist and medium. The Impressionist dataset was originally collected by Orley Ashenfelter and Andrew Richardson at Princeton University in 1992, while the Contemporary dataset was constructed by Kathryn Graddy from the archives of Christie’s; we use both datasets in our research[[18]](#footnote-22) [[19]](#footnote-23). The regression model of Beggs & Graddy (2005) measure the effect of anchoring on the second sale price of an artwork by controlling for hedonic characteristics as well as unobserved price inputs, such as bidder behavior. Beggs & Graddy argue that the observed anchoring effects are primarily the result of buyers’ cognitive biases. The authors find strongly significant evidence for anchoring in both Impressionist and Contemporary genres, though no significant asymmetry between gains and losses appears for anchoring (and loss aversion is not evident either)[[20]](#footnote-24).

Beggs & Graddy (2009), using the same resale approach and data, dive deeper into anchoring effects on price, presale estimates, and the probability of a sale[[21]](#footnote-25). For price, they find that anchoring effects are stronger for Impressionist art pieces than for Contemporary ones, particularly for items that are resold quickly after a first sale. They also find an association between presale low estimates and anchoring, although anchoring does not seem to significantly affect the probability of sale (which is estimated with a probit model). Graddy et al. (2014) use a similar model and mostly corroborate these results, but express more uncertainty about whether anchoring effects should be attributed to buyers, sellers, or auctioneers. The anchoring models developed by Beggs & Graddy (2009) have been used in later anchoring research, such as Leung et. al (2013)[[22]](#footnote-26), and forms the basis of our own approach. We attempt to replicate selected results from Beggs & Graddy (2009) in a later section.

Bruno and Nocera (2008) study how anchoring affects presale estimates using a unique dataset of nearly 1,000 Italian paintings that have been sold at least twice (1985-2006)[[23]](#footnote-29). They regress the range of presale estimates on a multi-level dummy variable for anchoring to account for multiple past prices (anchors). The authors find significant evidence of anchoring. First, the existence of past prices makes the presale estimate range narrower, presumably because the auctioneer grows more confident[[24]](#footnote-30). Second, Bruno and Nocera find that the existence of a past price corresponds to the presale estimate range being more closely centered on the true hammer price. Hence, both the bias and variance of the presale estimate range seem to decrease in the presence of anchors. These findings are consistent with what we learned through interviews, namely, that specialists at auction houses research past sales before formulating estimates,as described earlier.

Even the order in which art pieces are auctioned can beget anchoring effects, as shown in Hong et al. (2015)[[25]](#footnote-31). For the semiannual Auction Week, a two-week auction series held every spring and fall across New York City[[26]](#footnote-32), Sotheby’s and Christie’s have an arrangement to alternate who holds their auction first. This is a natural experiment. Using 26 years of Auction Week data and an adapted version of the resale model in Beggs & Graddy (2009), Hong et al. find that average opening sale revenues significantly anchor later sales during the rest of an Auction Week. Specifically, they discover that if more expensive paintings are sold first, then Sotheby’s and Christie’s will pull in higher total revenue (+21% higher), and more works will sell overall (+11% more sales). They state that their anchoring coefficients are quantitatively comparable to those from Beggs & Graddy (2009). This is the only work we found that does not examine anchoring across resales of the same art piece. However, since they only analyze revenues averaged across many works, their model cannot be applied in our context.

Other behavioral research on art auctions exists, though much of it is more tangential to anchoring. In the art trade, there is the belief that if an art piece is bought in at auction, it becomes “burned” and will sell for less in the future. To test this quantitatively, Beggs & Graddy (2008)[[27]](#footnote-33) use a sample of repeat sales from the Impressionist and Contemporary datasets in Beggs & Graddy (2005). The authors find that on average, burned paintings seem to sell for significantly less (-30%), particularly if they are resold at the same auction house within 2 years (-37%). Whether this is directly due to buyer perceptions of failure, however, is ambiguous.

Sentiment, emotion, and mood are also topics of research. For instance, Canals-Cerda (2012) analyze art auctions and seller reputations on eBay, and discover that negative feedback very significantly lowers sale price and the probability of sale.[[28]](#footnote-34) Penasse et al. (2014) collect survey data on sentiment toward selected artists in the art community, and find that strong confidence can predict art returns in the short run.[[29]](#footnote-35) Furthermore, De Silva et al. (2012) examine if weather, a proxy for mood, significantly impacted art auctions at Sotheby’s and Christie’s during the period 1990-2007.[[30]](#footnote-36) They find a weakly significant effect, suggesting that external emotional shocks do affect art auction activity.

In the aforementioned literature, the exact mechanism by which past quantities anchor future ones is treated as a black box; only the impact is noted. This is consistent with the definition of anchoring we provided earlier, as biases need not emerge from purely psychological factors. Rather, it is enough to say anchoring occurs when past quantities bias future ones, even though hedonic factors should be the only determinants.

**ON THIS RESEARCH**

It is clear that anchoring is pervasive in the art auction market, especially since empirically and anecdotally, psychological and behavioral factors seem to be significant predictors of auction activity. However, the research to date (except Hong et al. 2015; see above) has studied anchoring only in the context of resale. This is problematic because, as Beggs & Graddy (2009) acknowledge, it is extremely uncommon to encounter multiple sales of the same artwork. This is further limited by large time gaps between sales, which tend to weaken possible anchoring effects[[31]](#footnote-37). Additionally, it is difficult to show resale observations refer to the same art piece, since an artist may create multiple pieces with the same medium, dimensions, and so forth. Beggs & Graddy (2009) manually cross-checked their resale data against presale catalogs.

Most importantly, a shared (flawed) assumption across much of the aforementioned literature on anchoring is that hedonic quality does not change much across auction sales. In talking with Mark Best at Sotheby’s, we were surprised to hear how much artwork can deteriorate over time. Prints may tear accidentally, fade under glass, or become punctured, if tacked to the wall for decoration. The canvas of a painting can weaken over time, and must be “relined” with a new canvas attached to the back for extra support. Restoration (often by an unwitting owner) can also harm the value of an art piece: protective glaze must be scraped off, retouched paintings must be scrutinized under ultraviolet light, and so forth. We suspect these factors explain why Beggs & Graddy (2009) find stronger anchoring effects for Impressionist artworks than for Contemporary ones. Paintings in the former category come from classic Impressionists artists such as Renoir and Monet, are an order of magnitude more valuable in both presale estimates and prices,[[32]](#footnote-38) and are thus probably far better maintained. This preserves their hedonic quality and better allows past sales to anchor future ones.

If an art piece can change over time, how can we test for anchoring? The key is to control for quality differences between the good in its current state and the good in its initial state. In all existing literature we are aware of, the anchor is always a previous sale of the same good. However, if we control adequately for quality changes between the anchor and the current art piece, then we may use related artwork (substitutes) as the anchor instead of past sales. This is the intuition behind our generalization of the original anchoring model in Beggs & Graddy (2009), which we introduce in the next section.

1. Furnham, Adrian, and Hua Chu Boo. "A literature review of the anchoring effect." *The Journal of Socio-Economics* 40.1 (2011): 35-42. [↑](#footnote-ref-1)
2. Tversky, Amos, and Daniel Kahneman. "Judgment under uncertainty: Heuristics and biases." *science* 185.4157 (1974): 1124-1131. [↑](#footnote-ref-2)
3. http://soco.uni-koeln.de/files/jpsp73.pdf [↑](#footnote-ref-3)
4. Bergman, Oscar, et al. "Anchoring and cognitive ability." *Economics Letters*107.1 (2010): 66-68. [↑](#footnote-ref-4)
5. Strack, Fritz; Mussweiler, Thomas (1997). "Explaining the enigmatic anchoring effect: Mechanisms of selective accessibility.". Journal of Personality and Social Psychology 73 (3): 437–446. doi:10.1037/0022-3514.73.3.437. [↑](#footnote-ref-5)
6. Furnham, Adrian, and Hua Chu Boo. "A literature review of the anchoring effect." *The Journal of Socio-Economics* 40.1 (2011): 35-42. [↑](#footnote-ref-6)
7. Rajendran & Tellis (1994); Greenleaf (1995); Geltner (2011); Dougal et al. (2012); Furnham, Adrian, and Hua Chu Boo. "A literature review of the anchoring effect." *The Journal of Socio-Economics* 40.1 (2011): 35-42. [↑](#footnote-ref-7)
8. Frykblom, Peter, and Jason F. Shogren. "An experimental testing of anchoring effects in discrete choice questions." *Environmental and resource economics* 16.3 (2000): 329-341l Winter, Joachim. "Bracketing effects in categorized survey questions and the measurement of economic quantities." (2002); Flachaire, Emmanuel, and Guillaume Hollard. "Starting point bias and respondent uncertainty in dichotomous choice contingent valuation surveys."*Resource and energy economics* 29.3 (2007): 183-194. [↑](#footnote-ref-9)
9. Kinney Jr, William R., and Wilfred C. Uecker. "Mitigating the consequences of anchoring in auditor judgments." *Accounting Review* (1982): 55-69. [↑](#footnote-ref-12)
10. Bucchianeri, Grace W., and Julia A. Minson. "A homeowner's dilemma: Anchoring in residential real estate transactions." *Journal of Economic Behavior & Organization* 89 (2013): 76-92. [↑](#footnote-ref-13)
11. Mussweiler, Thomas. "Sentencing Under Uncertainty: Anchoring Effects in the Courtroom1." *Journal of applied social psychology* 31.7 (2001): 1535-1551. [↑](#footnote-ref-14)
12. Green, Donald, et al. "Referendum contingent valuation, anchoring, and willingness to pay for public goods." *Resource and Energy Economics* 20.2 (1998): 85-116. [↑](#footnote-ref-15)
13. Nianhang, Xu, and Wu Shinong. "A Study on Anchoring Effect for Non-tradable Share Reform of Listed Companies in China [J]." *Economic Research Journal* 1 (2007): 009. [↑](#footnote-ref-16)
14. Lucking‐Reiley, David, et al. "Pennies from ebay: The determinants of price in online auctions\*." *The Journal of Industrial Economics* 55.2 (2007): 223-233; [↑](#footnote-ref-17)
15. Ariely, Dan, George Loewenstein, and Drazen Prelec. "Tom Sawyer and the construction of value." *Journal of Economic Behavior & Organization* 60.1 (2006): 1-10. [↑](#footnote-ref-19)
16. Wolk, Agnieszka, and Martin Spann. "The effects of reference prices on bidding behavior in interactive pricing mechanisms." *Journal of Interactive Marketing* 22.4 (2008): 2-18. [↑](#footnote-ref-20)
17. Beggs, Alan, and Kathryn Graddy. "Testing for reference dependence: An application to the art market." (2005). [↑](#footnote-ref-21)
18. Richardson, Andrew. 1992. “An Econometric Analysis of the Auction Market for Impressionist and Modern Pictures, 1980-1991.” Senior thesis, Department of Economics, Princeton University. [↑](#footnote-ref-22)
19. Beggs, Alan, and Kathryn Graddy. "Testing for reference dependence: An application to the art market." (2005). [↑](#footnote-ref-23)
20. Loss aversion is another behavioral bias that says losses are felt more strongly than equivalent gains. [↑](#footnote-ref-24)
21. Beggs, Alan, and Kathryn Graddy. "Anchoring effects: Evidence from art auctions." *The American Economic Review* 99.3 (2009): 1027-1039. [↑](#footnote-ref-25)
22. Leung, Tin Cheuk, and Kwok Ping Tsang. "Anchoring and loss aversion in the housing market: implications on price dynamics." *China Economic Review* 24 (2013): 42-54. [↑](#footnote-ref-26)
23. Bruno, Brunella, and Giacomo Nocera. "Investing in art: The informational content of Italian painting pre-sale estimates." *Available at SSRN 1179183*(2008). [↑](#footnote-ref-29)
24. Specifically, both the relative and absolute range between low and high estimates. [↑](#footnote-ref-30)
25. Hong, Harrison, et al. "Ordering, revenue and anchoring in art auctions." *The RAND Journal of Economics* 46.1 (2015): 186-216. [↑](#footnote-ref-31)
26. http://www.artspace.com/magazine/news\_events/the\_heat\_index/how\_to\_understand\_new\_york\_record\_auction\_week-52310 [↑](#footnote-ref-32)
27. Beggs, Alan, and Kathryn Graddy. "Failure to meet the reserve price: The impact on returns to art." *Journal of Cultural Economics* 32.4 (2008): 301-320. [↑](#footnote-ref-33)
28. Canals-Cerdá, José J. "The value of a good reputation online: an application to art auctions." *Journal of Cultural Economics* 36.1 (2012): 67-85. [↑](#footnote-ref-34)
29. Pénasse, Julien, Luc Renneboog, and Christophe Spaenjers. "Sentiment and art prices." *Economics Letters* 122.3 (2014): 432-434. [↑](#footnote-ref-35)
30. De Silva, Dakshina G., Rachel AJ Pownall, and Leonard Wolk. "Does the sun ‘shine’on art prices?." *Journal of Economic Behavior & Organization*82.1 (2012): 167-178. [↑](#footnote-ref-36)
31. See Graddy et al. (2014); Hong et al. (2015). [↑](#footnote-ref-37)
32. See Table 1 and 2 – sample means – in Beggs & Graddy (2009). [↑](#footnote-ref-38)