



ACEI Working Paper Series

**DOES NUDITY SELL? AN ECONOMETRIC ANALYSIS OF
THE VALE OF FEMALE NUDITY IN MODIGLIANI
PORTRAITS**

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AWP-02-2020

Date: October 2020

Does nudity sell? An econometric analysis of the value of female nudity in Modigliani portraits

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Abstract

Of the four most expensive works of art ever auctioned, three are portraits of nude women (ArtPrice, 2018). Of these three female nudes, two were painted by Amedeo Modigliani. In light of this artist's contribution to the conceptualisation of female nudity in modern art, our paper examines to what extent the presence of female nudity influences the economic value of his portraits. Based on the significance the existing art-historical literature bestows on female nudity in western painting, we examine whether the artistic importance of this genre correlates to its economic value.

This research offers a quantitative evaluation of the female nude in the art market. By employing hedonic regression, we are able to analyse whether the presence of female nudity affects the price that these paintings achieve at auctions. The sample, collected primarily from ArtPrice, consists in 924 sales of Modigliani paintings and drawings. The research confirms that nudity has a positive and relevant influence on the determination of the hammer and estimated prices. Although limited in generalisability, the research assesses that particular aspects relative to the aesthetic value of art are reflected in its economic value, at least in the case of Modigliani.

KEYWORDS: art market; art auctions; economic value; artistic value; Amedeo Modigliani

JEL Classification: Z1

I. Introduction

Three of the four most expensive works of art ever auctioned are portraits of women (ArtPrice, 2018). Each of the canvases features a female figure who, somewhat positioned at the centre of the scene, sensually stares into the eyes of the viewer. All three women are nude, revealing their voluptuous bodies, seeking to draw the spectator onto the canvas. These paintings, auctioned between 2015 and 2018, were sold for prices ranging between 132 and 160 million euros (ArtPrice, 2018). Two of them were painted by Amedeo Modigliani. This artist, whose style oscillated between Impressionism and Avant Garde, is considered a seminal contributor to the conceptualisation of nudity in modern art (Rothwell, 2006). His nude portraits were part of a series commissioned by his dealer Léopold Zborowski, exhibited in Paris in a scandalous show at the beginning of the last century (Christie's, 2015). These paintings are two of only a handful of artworks ever sold for over 130 million euros (Platt, 2018). The most recently auctioned, *Nu Couché*, also broke records for being the painting with the highest ever estimated price – of €135 million - placed on a work of art at auction (Sotheby's, 2018).

These observations beg the question of whether the presence of female nudity in artworks exercises some influence on their economic valorisation. In light of Modigliani's artistic contribution relative to female nudity in modern art, our paper examines whether and to what extent the presence of female nudity influences the economic value of his portraits. Given the significance the existing art-historical literature bestows on female nudity in Western painting, we examine whether the artistic worth of this genre translates to a higher price. A few earlier econometric studies included nudity as one factor among a multitude of variables potentially influencing the economic valuation of a work of art (Renneboog and Spaenjers, 2012; David, n.d.). Nonetheless, with large samples and research questions focusing on broader aspects of pricing artworks, the nudity variable mostly yielded insignificant results. Overall, although the artistic worth and qualitative value of female nudity in the visual arts has been explicitly appraised by art historians and critics, its impact on price, especially for an artist whose reputation is so deeply embedded in the artistic nude, has yet to be investigated.

Whether and to what extent the artistic value of artworks is connected to their market value remains much debated. Some argue that the aesthetic and commercial values of cultural goods are completely unrelated: the first responds to intrinsic inputs and motivation, while the other follows trends and different extrinsic factors (Abbing, 2002). In contrast, others claim that the aesthetic, cultural character of works of art constitutes a major influence in the determination of their price in the market

(Grampp, 1989). Therefore, we contribute to this discussion by addressing the following research question: *To what extent does the presence of female nudity affect the price of Modigliani's portraits at auction?* We examine both the impact on the estimated and the hammer price.

Modigliani provides a particularly interesting case, since his reputation is inherently attached to modern portraiture featuring nudes (Rothwell, 2006). Moreover, the time frame of his artistic career at the earlier stages of the modern art makes his repertoire a fascinating one to analyse. Formed by the Renaissance, Romantic and Baroque schools and directly influenced by avant-garde artists such as Paul Cézanne and Pablo Picasso, Modigliani provides for a good case study of the shifting definition of the nude in juxtaposition with its perpetual artistic value (Blessing, 2019; Rothwell, 2006). As for the economic value of nudity, the present study considers the price of paintings sold at auction as reflective of their economic value. Specifically, this research includes hammer and estimated prices, together with other hedonic characteristics, from online databases such as Artprice.com.

II. The female nude in context: definition, artistic and historical relevance

According to Pointon (1990), definitions and perceptions of female nudity are subject to significant variations across time. Regardless of the appearance of the subject on the canvas, nudity seems far from being a category with well-defined boundaries and clear parameters. In fact, according to Pointon (1990), the artistic nude is a 'form of rhetoric' (p.14). Hence, the definition and general perception of female nudity depend on the wider context of the image and on the environmental atmosphere in which such image is displayed (Nead, 1992; Pointon, 1990). For instance, within the art gallery space, the female nude is praised as a form of high art and a symbol of legitimate, high culture (Nead, 1992, p.101). In contrast, when displayed in venues outside the art world, the nude becomes an expression of vulgarity and cultural disgrace (Nead, 1992). In this sense, artistic female nudity, rather than one of definition, becomes an issue of legitimation.

In order to differentiate legitimate, high forms of artistic nudity from ones of vulgarity, Clark (1953) emphasises that nudity and nakedness are different concepts. Whilst the former consists in the subject and form of high art, the latter simply implies the complete or partial deprivation of clothes (Clark, 1953). Between the two, there exists a very specific relation: in Clark's words, the naked body is

the ‘point of departure’ for the creation of the nude (p.8), which, in turn, is the product of the reconstruction of the real human body and its transformation into ideal form. Hence, the artistic nude is a mere “recomposition” of the body into a figure of ideal proportions and aesthetic perfection (Clark, 1953). The female nude stands at the end of the process of idealisation of the naked from vulgar element into form of high art.

Although highly debated, Clark’s differentiation between the terms of nudity and nakedness is linguistically undeniable. Even when interpreted in literal terms, the expression “nudity” is meant to overcome a sense of embarrassment and prudency, and elevate nakedness from mere state of vulnerability to one of high art (Bonfante, 1989). The perfect illustration of this process is represented by Modigliani: although his nudes were initially contested for being too bold, too “naked”, and rejected by the artistic and critic community of his time, they are now recognised as aesthetically relevant and essential in the transition between traditional and modern art (Rothwell, 2006). This proves that each definition of nudity needs to be contextualised in the social and cultural environment in which it is produced and consumed, and thereby confined to that specific circumstance and timeframe. Rather than a fixed category, female nudity in high art, and the ideal female body in society, is a constantly changing and structurally diverse concept (Hollander, 1993; Pointon, 1990).

Regardless of its facets and definitions, female nudity stands at the cornerstone of Western high art (Clark, 1953). For its constant presence in centuries of artistic developments, the female nude is one of the most relevant yet controversial genres of art history, and an extremely interesting element to analyse (Clark, 1953; Forster, 2011). When it comes to addressing its artistic value, art historians, critics and experts express in unison that female nudity has been and continues to be at the centre of artistic expression, as *the* subject and form of high art (Nead, 1990). From a historical perspective, representations of nudity have evolved hand in hand with the developments of figurative art and the emergence of artistic movements. From the 25000-year-old Willendorf Venus¹ to the most recent Jenny Saville portrait², the female nude has been depicted in Western art in every form, shape, and era. However, it is especially since Modern art that female nudes have become emblematic of the artistic shifts from one movement to another, challenging the existing aesthetic and academic ideals (Clark, 1953; Sorabella, 2008). Prominent for its debated morality, adjacency to vulgarity and, from the Modern age, closeness to pornography and female sexualisation, the female nude has generated an inestimably high artistic value that has perpetuated throughout centuries of art history. Crossing the line between high

art and indecency, it can be interesting to analyse a female nude that combines definitions of nudity and nakedness at the same time; an artist who portrays notions of *permanence and timelessness* of traditional ideal beauty, while simultaneously revolutionising the definition and implications of nudity (Pointon, 1990, p.120; Eck, 2001). This artist is Amedeo Modigliani.

Since female nudity became emblematic of his style and legacy, Modigliani's presents an interesting case study. Moreover, the artistic style he developed, equally influenced by classic ideals of artistic beauty and modern innovative perspectives, is a crucial factor in his legacy and central to this research. From the oval face lines to the almond-shaped eyes, from the extended, swanlike length of the necks to the sinuous S-shape of the bodies, Modigliani's portraits perfectly amalgamate Modern candour and Classic delicacy. Shocking for their straightforwardness and unapologetic bareness, these nude portraits fluctuate between erotic provocation and allegorical, high art. Without any mythological reference, Modigliani depicted nudes who refuse to carry any connotation but that of nudity itself. In this sense, the concept of female nudity, rather than the women portrayed, is the real subject of Modigliani's paintings (Rothwell, 2006). He balances between Classicism and Modernity, between idealisation and eroticism, thereby positioning his nudes exactly on the dividing line between nudity and nakedness. Therefore, his inclusive approach towards different definitions of female nudity makes him the perfect artist for this study.

Out of his abundant production of female nudes, the most outstanding were the 35 portraits commissioned by Léopold Zborowski and exhibited in the only solo show in Modigliani's lifetime (Rothwell, 2006). However, considered too voluptuous and scandalous by the Parisian public, the nudes had to be covered and the exhibition closed soon after its inauguration. Ironically, this controversy drew attention towards Modigliani, and exhibition laid the foundation for his future notoriety and fame. From this episode, 'his reputation has been dominated by his nudes, and his name has become synonymous with them' (Rothwell, 2006, p.13). As the two most expensive works of art in Modigliani's repertoire were part of this collection, these nudes provide the key through which the discourse of the cultural - artistic and economic - value of female nudity can begin. These two sales suggest that the immense artistic and historical value of his female nudes might be reflected in their economic value. Could this hypothesis be applied to Modigliani's nudes?

¹ Sculptural representation of female nude figure from the upper Paleolithic period (Dixon & Dixon, 2011)

² Contemporary British artist eminent for paintings of voluptuous female nudes (ArtNet, 2019).

The present study examines the correlation between artistic and economic value. Given the verifiable high artistic worth of the nude in general and Modigliani's nude in particular, it is expected that the artistic value of Modigliani's nudes will be reflected in their market price. Therefore, applying hedonic regression, the following hypotheses will be put to the test:

H1: Female nudity in Modigliani portraits positively and significantly affects their hammer price.

H2: Female nudity in Modigliani portraits positively and significantly affects their average estimated price.

III. Methodology & Data

Among statistical methods studying price determination in the art market, hedonic regression is one of the most commonly used. This can be explained by the several advantages it presents, especially when compared with other methods relying on the calculation of price indexes to account for quality variations, such as the repeat sales method. First, differently from the repeat sales method, hedonic regression allows for larger sets of objects to be included in the analysis (Agnello, 2010; Ginsburgh, Mei & Moses, 2006). Second, it provides for more reliable estimates to measure the effects of specific characteristics on the economic value of each sales transaction (Agnello, 2010; Renneboog & Spaenjers, 2012). Finally, this model generates coefficient estimates with smaller standard deviations than those obtained through repeat sales analyses (Agnello, 2010, p. 66). Altogether, not only does hedonic regression overcome the biased sample issues related to repeat sales, but it also accounts for the potentially relevant factors that repeat sales regression fails to include.

Despite its perks, this method presents some drawbacks too. For instance, it fails to systematically include variables that measure all relevant tangible and intangible characteristics of the artworks in the sample (Renneboog and Spaenjers, 2012; Stetco, 2017). This can lead to a common issue referred to as 'misspecification of variables' (Chin & Chau, 2003, p.148). In other words, the analysis could easily include variables that are irrelevant for the model, while ignoring other elements that could potentially be important (Chin & Chau, 2003). Nevertheless, more recent analyses based on this method employ a number of common variables which seem relevant in the determination of hedonic prices in general, and that, for this reason, will be referred to as 'standard hedonic control variables' (Oosterlinck and

Radermecker, 2019, p.83). Based upon literature and recent studies employing them, these variables can be found listed in *Table 1*.

Table 1: Standard Hedonic Control Variables based on Literature:

Standard Hedonic Control Variables	Literature
<i>Technique & Medium Variables</i>	
<i>Dimension Variables</i>	David (2012); De Silva, Pownall & Wolk (2012); Euwe & Oosterlinck (2017); Graddy & Pownall (2016); Lazzaro (2006); Oosterlinck & Radermecker (2019); Renneboog & Spaenjers (2012); Sagot-Duvauroux (2003);
<i>Authenticity Variables</i>	David (2012); Euwe & Oosterlinck (2017); Lazzaro (2006); Oosterlinck & Radermecker (2019); Renneboog & Spaenjers (2012); Onofri (2009); Sagot-Duvauroux (2003);
<i>Salesroom Variables</i>	De Silva et. al. (2012); Graddy & Pownall (2016); Lazzaro (2006); Oosterlinck & Radermecker (2019); Renneboog & Spaenjers (2012); Sagot-Duvauroux (2003);
<i>Period of Creation Variables</i>	Euwe & Oosterlinck (2017); Lazzaro (2006); Oosterlinck & Radermecker (2019); Renneboog & Spaenjers (2012); Onofri (2009); Sagot-Duvauroux (2003);
<i>Year of Sale Variables</i>	David (2012); Euwe & Oosterlinck (2017); Lazzaro (2006); Oosterlinck & Radermecker (2019); Renneboog & Spaenjers (2012); Onofri (2009); Sagot-Duvauroux (2003)

Manually collected between February and April 2019, the data was retrieved primarily from the online ArtPrice database. For Modigliani, ArtPrice includes sales that took place from 1984 onwards through European as well as international auction houses. Moreover, by displaying actual sales as well as buy-ins, the website offers an extensive perspective on the trends of the art market. The sales of Modigliani’s paintings are divided in four different categories based on the type of artworks for sale. Information was collected from all categories except for *sculptures* and *prints*: whilst three-dimensional artworks were removed not to undermine the accuracy of a model fundamentally based on two-dimensional artworks, prints were excluded because the 245 sales listed on ArtPrice were deemed non representative of the large market for this type of artworks (Pesando,1993).

The sales collected in the dataset were obtained by browsing the auction sales for the categories *painting* and *drawing-watercolour* from April 2019 to the earliest recorded sales in 1984. Whilst the former category displays 215 sales, auctions for the latter have been more frequent, reaching a number of 828 sales (ArtPrice, 2019). For each transaction, the collected information includes the title of the artwork, the year of creation, the size and type of medium, the technique of realisation, the presence of a

signature or stamp, its provenance, past exhibitions, the date and place of sale, hammer and estimated prices, and information about the subject of the painting. Hammer and estimated prices were collected in that considered representative of the evaluation of two different stakeholders in the art market: art collectors and auction house experts respectively. In order to assess female nudity, the presence an image of the painting was crucial. The data collected includes all the standard hedonic control variables as well as the particular subject characteristics this study aims to measure. Although most observations were collected from ArtPrice, our database was systematically compared with ArtNet and ArtValue, in order to provide for a reliable and comprehensive corpus of sources. This procedure became especially important when ArtPrice omitted some essential information about the sale, such as the image of the artwork or the estimated and hammer price.

Despite this measure, the amount of data collected – of 924 lots between paintings and drawings - is lower than the total amount presented in the website ArtPrice - of 1043 lots. For the most part, this difference is due to some missing images of the artworks auctioned. Although art pieces with specific titles could be easily identified on other databases online, more generic titles such as *Portrait de femme*, which in Modigliani's repertoire occurred quite often, were impossible to distinguish. If the title failed to describe the gender and nudity of the subject of the painting, and the image of such painting could not be retrieved, the sale had to be excluded from the dataset. In addition, as the study concerns portraiture, sales of landscape paintings were excluded. Similarly, lots portraying male nudes and sexually ambiguous paintings representing hermaphrodites were removed from the sample. Although, considering Modigliani's style, it was generally obvious to assess whether the element of nudity in a painting was present, these ambiguous drawings required female nudity to rely on a very specific definition. In short, portraits that outline female subjects revealing private body parts in a state total or partial undress were identified as female nudes. The concept of nudity employed in this research is inclusive of conditions of both partial and total undress. Hence, all the portraits that represented or outlined female silhouettes that more or less explicitly disclosed their nude figure, whether elements such as pubic hair and nipples were present or not, were categorised as nudes. This implies that those nudes that, although entitled *Hermaphrodite*, only display female body parts were included in the sample.

Another issue that affected the data collection was the absence of both the hammer and estimated price. In these cases, the information regarding the specific sale could not be collected. On the other hand,

when the lot remained unsold or the hammer price was not listed but the estimated price was (and vice versa), the data was collected. Specifically, of the 924 lots collected, 69 estimated prices and 33 hammer prices were missing, whilst 209 lots remained unsold. This results in two databases, one based on the hammer price - of 685 sold lots, and the other on the estimated price - of 855 sold or unsold lots. Dividing the data in two datasets was useful to conduct separate analyses including the hammer and average estimated price respectively as dependent variables, and test whether the element of nudity is evaluated differently by different actors in the market i.e. the auction house and individual collectors.

The data was collected in two separate Excel sheets, coded and analysed in Stata. To ensure that the hammer price database was free from bias, the quantity of unsold nudes was juxtaposed against the number of nudes in the total sample. The portion of unsold nudes with respect to the unsold portraits is of 21% - 43 unsold nudes with respect to 209 unsold paintings. The proportion of nudes in the total sample is of 26% - 237 nudes with respect to 924 paintings. Thus, in proportion, to the amount of nudes in the unsold lots is roughly similar to the number of nudes in the total sample. In fact, this comparison shows that, when nudes are offered in the auction market, they generally seem more likely to get sold than non-nudes. In order to understand how female nudity is valued, however, it is important to create a model that accurately describes its relationship with price.

The model employed in the present analysis is described as follows:

$$\ln p_i = \alpha + \beta n_i + \sum_{j=1}^J \gamma_j m_{ji} + \sum_{k=1}^K \delta_k s_{ki} + \sum_{x=1}^X \zeta_x d_{xi} + \varepsilon_i$$

Whilst $\ln p_i$ represents the natural logarithm of the price of painting i , α is the constant term, equal to the price of painting i when all the independent variables equal zero. The variable this study aims to measure is n_i : the *Female Nude* variable. Its coefficient β , expresses the direction and magnitude by which female nudity is expected to influence the dependent variable. The term m_{ji} is indicative of the control variables created for this particular sample and expected to influence the market value of the paintings in Modigliani's repertoire. The standard hedonic control variables are expressed through the terms s_{ki} and d_{xi} : the former represents dichotomous variables, whilst the latter refers to the numeric variables *Length* and *Width*, measured in cm. These control variables have been divided in different categories: Subject,

Technique and Medium, Dimensions, Authenticity, Salesroom and Year of sale (Appendix 1). Finally, ε_i represents the error term, with $i=1,\dots,I$; $j=1,\dots,J$; $k=1,\dots,K$; and $x=1,\dots,X$. Except for the dimension variables, all the characteristics in the sample were transformed into dummy variables, assuming the value of one when a specific characteristic was present, and zero otherwise.

On one side of the equation, the dependent variable is the natural logarithm of the price of the portraits. Regression was run with both the hammer price and average estimated price as dependent variables respectively. To take inflation into account, all the prices were adjusted from nominal to real using the Consumer Price Index (CPI), with 2015 as base year and euro as currency (OECD, 2019). Although the CPI is essential to capture the market more accurately, using the euro as currency is limiting. First, as the euro was implemented in the late 1990's, inflation in the time period between 1984 and 1990 - first year in which an inflation rate for the euro becomes available on the OECD website – could not be taken into account. Second, as the CPI adaptation in the dataset follows changes in the value of the euro, the adjusted price of sales that took place outside of the euro zone could potentially be compromised. Although these limitations need to be acknowledged, inflation rates for different currencies were compared and deemed extremely similar for European art markets in and outside of the euro zone as well as for the United States (OECD 2019). Considering that the majority of sales took place either in Europe or in the United States, the limitations caused by currency exchanges and inflation become less relevant. Moreover, using the years of sales as dummy variables contributes to reducing this problem by capturing changes in the monetary values of the lots on a yearly basis.

Prices collected were excluded of buyer's premium and transaction costs: although this information could be important to calculate the current and future investment performance of the art market, such analysis goes beyond the scope of this research. In fact, as the element of female nudity is inherent to the aesthetic presence of a work of art, it seems more adequate to consider a price value that refers exclusively to the economic worth of the artwork in itself. As the price that the collector is willing to pay for the artwork alone, the hammer price is the primary quantitative value on which our study relies. Nonetheless, as the scope of this research is to investigate how nudity is valued in the art market overall, it was deemed important not to limit the economic valuation of Modigliani's nudes to the collectors' willingness to pay. To increase the inclusivity of this study, the average estimated price was also taken into account as representative of another stakeholder's valuation: auction house experts³.

On the other side of the equation, the element on which this research mainly focuses is female nudity. *Female nude* is translated into the dummy variable n_i that assumes the value of 1 if the painting under scrutiny features a female nude and 0 otherwise. As nudity involves a physical characterisation of the protagonist of the canvas, it was placed under the Subject category. Among the different subjects that Modigliani portrayed, the most commonly auctioned subjects are female portraits. With over 650 lots containing nudes (*Table 2*), portraits of female subjects are sold almost three times more often than male, presumably because they are the most frequent subject in Modigliani's repertoire.

Table 2: Dummy variables by number of observations and percentages

Variable	Observations	Percentage
Subject		
<i>Male</i>	264	28%
<i>Female Dressed</i>	423	46%
<i>Female Nude</i>	237	26%
Technique & Medium		
<i>Oil on canvas</i>	141	15%
<i>Oil on other</i>	45	5%
<i>Pencil on paper</i>	551	60%
<i>Watercolour on paper</i>	46	5%
<i>Ink on paper</i>	60	6%
<i>Other technique on paper</i>	81	9%
Salesroom Location		
<i>Paris</i>	207	22%
<i>London</i>	229	25%
<i>New York</i>	258	28%
<i>Other city</i>	230	25%
Auction House	-	-
<i>Sotheby's</i>	315	34%
<i>Christie's</i>	179	19%
Authenticity		
<i>Signature</i>	671	69%
<i>Stamp</i>	62	6%
<i>Provenance</i>	108	11%
<i>Exhibition</i>	139	14%

³ See Ekelund, Jackson & Tollison (2013) for more details regarding the relationship between the estimated price and the final auction price.

In addition to *Female Nude*, the variable *Male* was created to guarantee that the nudity factor could also be distinguished from the sex of the subject in the painting. As previously explained, the sample only includes male portraits who are dressed. Finally, the last variable in the Subject category is *Notorious Names*. Differently from the other controls, this variable is normally not used in standard hedonic regression. Nevertheless, it was created to capture the potential influence that the popularity of the subjects portrayed by Modigliani could have on the price of the lot. Since 302 portraits in the sample represent individuals - such as Léopold Zborowski, Jeanne Hébuterne or Pablo Picasso - who were close to Modigliani during his life and are well known even today, the presence of these names in the title of the paintings is likely to exercise some influence on their market value (Oosterlinck & Radermecker 2019). Variables *Male* and *Notorious Names*, which have purposely been added to study this specific sample, are captured in the model by the term m_{ji} .

The remaining independent variables, namely s_{ki} and d_{xi} , consist of standard controls generally employed in hedonic analyses and adapted to the specific characteristics of the lots in the sample. The standard controls in the model are represented by two different letters because all variables are dichotomous (s_{ki}), except for the dimension variables (d_{xi}), which will be included in their squared value. Finally, it is important to point out that period of creation variables were completely removed from this case study: given the brevity of his life, Modigliani's repertoire is mostly limited to the short period between 1914 and 1919 in which he was most prolific. In addition, a number of his creations, especially drawings and watercolours, lack certain information on their period of creation. Hence, the period of creation has not been considered in this analysis.

IV. Empirical Analysis & Results

IV.I Hammer Price Model

In our first analysis, the dependent variable consists in the natural logarithm of the real hammer price. Before running any regressions, the interaction terms *Paris/Sotheby's*, *Paris/Christie's*, *London/Sotheby's*, *London/Christie's*, *NewYork/Sotheby's* and *NewYork/Christie's* were created, connecting the location of the sale with the auction house. Furthermore, the interaction terms *Signed Drawings*, *Signed Oils* and were generated to test whether the significance of the variable *Signature* is

subject to any change when combined with other technique & medium variables. To test the relationship of *Female Nude* with other variables, the interaction terms *Signed Nudes*, *Nude Drawings* and *Nude Oils* were also created. Finally, in order to examine the relationship between the dimension variables and price, the terms *Length & Width* were squared. *Table 3* shows the results of this regression. With the new variables, this model shows a high R-squared and β coefficient relating nudity to the hammer price. Specifically, it explains 84,16% of the variation in the hammer price, and the female nudity coefficient of 0,58 is positive and relevant⁴. This implies that, when female nudity is present, the hammer price increases by 0,58%. Therefore, the analysis confirms *H1*, demonstrating that the characteristic of female nudity in Modigliani portraits positively affects their hammer price in auction sales by 0,58%.

As for the remaining variables, at first glance, it is interesting to notice that the coefficient of the *Male* variable is negative and significant. This implies that, when a Modigliani portrait is auctioned, it will sell for a price 0,18% lower when the subject portrayed is male compared to when the subject is female. Another subject variable is the notoriety of the characters portrayed. When representing a notorious face in Modigliani's life, or some famous artist of his time, the hammer price of the portrait is expected to increase by 0,31%. It is interesting to observe how the reputation, not only of the artist, but also of his subject influences the market value of a painting, at least in the case of Modigliani.

Among the standard hedonic control variables in *Table 3*, the insignificance of the authenticity category stands out, as proof of authorship normally increases the value of artworks. For instance, *Signature* is usually a positive and significant variable (Ginsburgh, Mei & Moses, 2006), in that it directly connects the artwork to the name of the artist. However, in this case the variable is irrelevant. The singularity of this result may have different interpretations: considering the iconic style employed constantly and coherently by Modigliani throughout his career, the recognisability of his artworks facilitates their attribution, and might reduce the importance of the presence of his signature. Nevertheless, that would not exclude the possibility for fake artworks in his name to be exchanged in the art market. Thus, the insignificance of this variable remains difficult to interpret. Similar to *Signature*, the variables *Stamp* and *Provenance* show statistically insignificant results too. Although the former is characterised by a negative coefficient, both variables fail to convey any significant information about the hammer price. Whereas in case of *Stamp* this could be explained by the lower number of lots – 47 in total – distinguished by this characteristic, the amount of lots with clear provenance – 86 in total – should be enough to draw a more significant, and usually positive, prediction. Hence, this result is equally

surprising. In contrast, the remaining authenticity variable *Exhibition* is, as expected in hedonic regression (Oosterlinck & Radermecker, 2019), positive and significant.

Table 3: Hedonic Regression Results for Hammer & Estimated Price

Variable	Ln Hammer Price	Ln Estimated Price
<i>Female Nude</i>	0,581**	0,464**
<i>Male</i>	-0,179**	-0,115
<i>Notorious Names</i>	0,307**	0,236**
<i>Length</i>	0,025**	0,018**
<i>Length2</i>	-0,0000485	9,40E-06
<i>Width</i>	0,0088122	0,0196**
<i>Width2</i>	0,0000935	-6,40E-06
<i>Provenance</i>	0,2296182	0,0323602
<i>Exhibition</i>	0,528**	0,384**
<i>Signature</i>	0,3324329	0,2363248
<i>Stamp</i>	-0,0379311	0,0688496
<i>Oil/canvas</i>	2,405**	2,179**
<i>Oil/other</i>	1,848**	1,788**
<i>Pencil/paper</i>	-0,2060320	-0,3096**
<i>Watercolour/paper</i>	-0,1010035	-0,1924903
<i>Ink/paper</i>	-0,3193762	-0,342**
<i>Signed Drawings</i>	-0,553**	-0,401**
<i>Signed Oils</i>	0,1477579	0,2719340
<i>Signed Nudes</i>	0,0482873	0,0576136
<i>Nude Drawings</i>	-0,0146077	-0,1034833
<i>Nude Oils</i>	-0,5525582	-0,666**
<i>Paris/Soth</i>	-0,1335905	-0,1113022
<i>Ldn/Soth</i>	0,626**	0,308**
<i>Ny/Soth</i>	0,380**	0,2697**
<i>Paris/Chris</i>	0,3182507	0,0839928
<i>Ldn/Chris</i>	0,366**	0,221**
<i>NyChris</i>	0,464**	0,287**
<i>Year of Sale</i>	Yes	Yes
<i>R-squared</i>	0,8416	0,8550
<i>Adjusted R-squared</i>	0,8255	0,8436

Results of hedonic regression with the interaction terms. The dependent variables are the natural log of the real hammer price in the second column and the natural log of the real estimated price in the third. Period considered is 1984– April 2019. Annual data are used for each model. In all regressions, coefficients are significant at the 95% confidence interval (**).

⁴ See Appendix 3 for full regression table

Among the medium & technique variables, the most relevant are *Oil/canvas* and *Oil/other*, displaying the high, positive and significant coefficients of respectively 2,41 and 1,84. This shows that, when the portrait is an oil painting on canvas, its price is expected to increase by 2,4%. This is the highest coefficient generated in the model. Nonetheless, the predictions related to the oil technique seem the only ones that matter, as the remaining variables *Pencil/paper*, *Watercolour/paper* and *Ink/paper* all present negative and statistically insignificant coefficients. The combination of the variables *Pencil/paper* and *Signature* shows an unexpectedly negative and significant relationship with price. Once again, this result is unusual in that signature supposedly increases the worth of artworks.

The interaction terms generated for the salesroom category display, almost in every case, a positive and significant relationship with price. Specifically, when the lot is sold in London or New York at Sotheby's or Christie's, its hammer price can be expected to increase between 0,38 and 0,62%. On the other hand, when the auction takes place in Paris, the hammer price seems more difficult to predict. One reason for this could be that London and New York are the most successful art markets in terms of volume of sales and prices generated (Renneboog & Spaenjers, 2012).

Regardless of the location of the auction, the year in which the lots were sold affects the hammer price positively and significantly for almost every year in the time span examined, with the exception of 1985. Similarly, the dimension variables also affect the hammer price positively up to a point of inflation, which is represented by the negative coefficient of the squared terms of *Length and Width*. Finally, when combined with the nude, other variables concerning authenticity, such as signature, or technique, such as oils and drawings, do not seem to generate any significant prediction.

IV.II Average Estimated Price Model

The same model used to explain the hammer price is employed in this section to regress the average estimated price. Regression was run with the same interaction terms created previously for the hammer price analysis. The results are displayed in *Table 3*. Once again, R-squared is high, and *Female Nude* remains positively and significantly influential, although lower than in the previous model. With this model, the estimated price equation is able to explain 85,55% of the price variation, and nudity positively affects the price with a significant coefficient of 0,46⁵. This implies that, when the painting portrays a

female nude, its estimated price is expected to be 0,46% higher than paintings with a dressed subject. As a consequence, the analysis confirms the validity of *H2*, entailing that the characteristic of female nudity in Modigliani portraits positively affects their estimated price in auction sales by 0,46%.

As for the remaining variables, some observations are worth of notice. The *Male* variable, for instance, has a negative yet not significant coefficient; whereas the *Notorious Names* variable is still significant and positive, indicating that auction house experts tend to value more a Modigliani whose title contains the name of a notorious person. Within the authenticity variables, *Provenance*, *Stamp* and *Signature* remain insignificant, whilst *Exhibition* has a positive and significant coefficient. Whereas the influence exercised by the first three variables on estimated price is not clear within this sample, the fact that a painting has been previously exhibited is expected to positively influence experts' estimation of its value. Within the technique & medium variables, the only insignificant variable is *Watercolour/paper*. On the one hand the oil technique strongly and positively influences the estimated price of Modigliani's artworks; on the other hand, works with pencil and ink on paper tend to decrease their expected estimated value. In the salesroom variables, as in the hammer price model, the combination of auction house and city seem to exercise positive and statistically relevant influence on the estimated price, with the exception of auctions located in Paris. In fact, in this case, regression fails to show any statistically relevant prediction. Similarly, among the interaction terms generated to study the effect of nudity and signature combined with each other as well as with some technique variables, most of the results are statistically insignificant. The exceptions occur once again in the case of *Signed Drawings*, which seem to exercise a negative and relevant influence on estimated price, and in the case of *Nude Oils*, which is surprisingly negatively significant. Finally, the year of sale and dimension variables generally seem to affect the estimated price of each lot in a positive and mostly significant manner.

⁵ See Appendix 4 for full regression table

IV.III Other Model Specifications

In order to address whether the hammer and estimated price models provide for accurate and strong predictions, this section applies two tests. First, the models are analysed through quantile regression to determine whether the positive and significant β coefficient of *Female Nude* experiences variations throughout different price ranges. Particularly relevant for the hammer price model, as the hammer price variation in the sample is quite considerable (Appendix 2), this test is essential to check whether the independent variables influence the dependent variable differently in different price ranges (Pesando,1993). By dividing the sample in different quantiles, it is possible to identify whether nudity remains relevant throughout different price categories. Second, as it has been noticed earlier, the currency conversion and European inflation rate might have caused some inaccuracy in the dataset. Therefore, the strength of the models is tested by running regression with prices adapted to the American CPI.

The results of the tests are presented in Appendices 5 and 6 respectively for each test taken. In each appendix, tables A display the results of the robustness tests for hammer price model, while tables B showcase those of the average estimated price model.

For the first test, *Tables A.1* and *A.2* (Appendix 5) display the results of quantile regression for the 25th and 75th quantiles respectively for the hammer price model. The results of quantile regression show that nudity has a positive and significant influence on the dependent variable in both quantiles considered. This implies that female nudity has a positive and significant coefficient throughout the different price ranges. Specifically, whilst β in the 75th quantile regression equals 0,53%, the coefficient in the 25th quantile regression assumes the noticeably higher value of 0,88%. Thus, the nudity element seems more influential for prices in the lower quantile of the dependent variable than for the higher ones. One explanation of this could be that collectors contemplating highly estimated artworks might be motivated by other factors, such as social or financial incentives, more than aesthetic reasons alone. That said, even when expected to exercise a lower influence on price, nudity remains an unequivocally relevant element. For the estimated price model, the results are displayed in *Tables B.1* and *B.2* (Appendix 5). As in the previous case, the tables display positive and significant coefficient both in the 25th and 75th quantiles, which implies that the nudity factor is significant in both estimated price ranges. Once again, the coefficient in the first quantile – of 0,76, is higher than for the last quantile, of 0,51. As a consequence,

although female nudity seems to exercise a greater influence in lower price ranges, it remains an influential factor throughout the entire sample.

Appendix 6 shows the results of regression with the prices adapted to inflation based on the US CPI. Although the conversion error could not be perfectly corrected, this test provides for a clear illustration of the resemblance between the two regression results even with different CPI's. In fact, even when prices are corrected with the American CPI, both R-squared and β in the hammer price model remain unchanged until the fourth decimal (see *Table A*). Similarly, for the average estimated price model, R-squared remains unchanged until the third and β until the second decimal (see *Table B*). Therefore, the currency and CPI of choice have not compromised the accuracy of neither model.

V. Conclusion

This research confirms the connection between art and economics through the evaluation of portraiture featuring nude women. In light of the fact that the artistic value of female nudity is rooted in its continuous and symbolic presence throughout art history, the economic relevance of the female nude was measured by analysing the auction sales of one of the most brilliant modern masters of the genre, Amedeo Modigliani. Since our research stemmed from the question of whether nudity has an influence on the price of his paintings, the analysis provides for an exhaustive and clearly positive answer. In other words, the results confirm both hypotheses that female nudity exercises a positive influence on the hammer and average estimated prices of Modigliani's portraits.

Nudity as a variable in studies employing hedonic regression had already been considered in the past, but only as part of much larger datasets with wide spectrum of many other variables in the subject category, and whereby nudity failed to show any statistically significant relationship with price. By focusing specifically on this one factor, we have shown that, when considered by itself, nudity can be significant in the assessment of the econometric value of artworks. In contrast to previous studies, female nudity is unequivocally relevant in the determination of prices of portraits, at least in the case of Modigliani. In particular, our analysis shows that female nudity increases the hammer price of Modigliani's portraits by 0,58%, and their average estimated price by 0,46%.

These results can help gain a better understanding of the preferences of collectors and, consequently, the various factors to consider when estimating the economic value of works of art. From a market perspective, this study can contribute to the development of auction strategies and the prediction of sales outcomes. Specifically, the research underscores the importance of including the art historical perspective in the economic assessment of works of art. Otherwise put, our study reveals the existence of a connection between art and economics through the value of Modigliani's nudes, showing that the artistic significance of the female nude clearly permeates its economic worth. Finally, in doing so, the provocative paintings of Amadeo Modigliani offer a tantalizing case to examine the impact of art theory and criticism on price.

Nevertheless, our research faces some limitations: primarily, being a case study of an individual artist, the results of the research offer a very specific answer to an equally specific question. For this reason, the findings cannot be generalised at face value and automatically applied to other artists. Especially when considering the relevance his female nude portraits meant for the formation of his reputation, Modigliani cannot be considered a *pars pro toto* for the entire art market. Moreover, as this research consisted of a case study based on a modest number of observations, some variables were not numerous enough to generate statistically significant results. A larger sample would also allow to distinguish among different degrees and types of nudity, and analyse the importance of the aesthetic element more closely. For instance, it would have been interesting to examine whether a partially dressed, completely undressed or simply outlined silhouettes made any difference in the economic evaluation of female nudity. Although the compact sample has allowed for a detailed analysis of the dataset - by creating variables that suited the sample, and generating statistically significant results - the logical next step would be to broaden this type of study to a larger, more inclusive sample.

Modigliani provides for an excellent example to advance the discussion around the nudity element in Western art. Equally close to the concepts of nudity and nakedness, he demonstrates that nudity is valuable in all its forms and definitions. The study of this artist also raises a host of further questions, among which whether there is any difference in the appreciation of nudity and nakedness in the market. Although this distinction can be highly subjective and difficult to assess, the twofold conception of nudity leaves many doors open for further investigations. Similarly, it would be relevant to compare whether the actors within the contemporary art market value female nudes of different artists as positively

as Modigliani's nudes. Finally, future research could inquire whether nude male subject has a different influence on the price of artworks. Overall, the overarching question remains whether nudity in its many guises and shapes sells, and only an interdisciplinary effort by both art historians and economists will be able to shed light on these enticing works of art.

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Appendix 1: Control Variables

Subject qualifiers:

Female Nude: takes the value of one if the painting portrays a female nude, zero otherwise;

Male: takes the value of one if the painting portrays a female nude, zero otherwise;

Reference Category: *Female Dressed*

Notorious Name: takes the value of one if the painting portrays a known subject, zero otherwise;

Technique & Medium qualifiers:

Oil on canvas;

Oil on other media (board, cardboard, panel, mixed media);

Pencil on paper;

Watercolour on paper;

Ink on paper;

Reference Category: *Other technique on paper*

Dimensions:

Height & Width expressed in cm;

Authenticity qualifiers:

Signature: takes the value of one if the painting is signed, zero otherwise;

Stamp: takes the value of one if the painting is stamped, zero otherwise;

Provenance: takes the value of one if provenance information is provided, zero otherwise;

Exhibition: takes the value of one if the painting was exhibited previously than the sale, zero otherwise;

Salesroom qualifiers:

Place of Sale: London; New York; Paris;

Reference Category: *Other city*

Auction House: Christie's; Sotheby's;

Reference Category: *Other auction house*

Year of Sale:

Dummy variables from 1984 to 2019.

Reference Category: *1984*

Appendix 2: Hammer and Estimated Price, Descriptive Statistics

Adj Hammer Price

	Percentiles	Smallest		
1%	5151,11	840,72		
5%	10712,83	1238,729		
10%	16410,00	1638,57	Obs	685
25%	29974,38	2306,718	Sum of Wgt.	685
50%	65892,00		Mean	1811129
		Largest	Std. Dev.	8184995
75%	287638,5	4,41e+07		
90%	4783722,	4,74e+07	Variance	6,70e+13
95%	9464463	1,12e+08	Skewness	11,73628
99%	2,46e+07	1,42e+08	Kurtosis	176,2041

Adj Estimated Price

	Percentiles	Smallest		
1%	5179,073	823,898		
5%	12590	2118,75		
10%	18424,65	4096,425	Obs	855
25%	31458,81	4485,285	Sum of Wgt.	855
50%	65892,00		Mean	1094339
		Largest	Std. Dev.	3091816
75%	287638,5	2,23e+07		
90%	4783722,	2,24e+07	Variance	9,56e+12
95%	9464463	2,36e+07	Skewness	4,069623
99%	2,46e+07	2,42e+07	Kurtosis	22,10694

Appendix 3: Regression Model with Hammer Price

Source	SS	df	MS	F(62, 611)	Prob > F	R-squared	Adj R-squared	Root MSE
Model	2402,26245	62	38,7461685	= 52,35	= 0,0000	= 0,8416	= 0,8255	= 0,86034
Residual	452,249073	611	0,740178516					
Total	2854,51152	673	4,24147329					

LnAdjHamPrice	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
<i>Female Nude</i>	0,5807422	0,1999065	2,91	0,004	0,1881549 0,9733295
<i>Year of Sale</i>					
1985	0,4971927	0,6177876	0,8	0,421	-0,7160521 1,710437
1986	1,199577	0,5640625	2,13	0,034	0,0918405 2,307313
1987	1,510995	0,5460389	2,77	0,006	0,4386544 2,583336
1988	1,388992	0,5475076	2,54	0,011	0,3137666 2,464217
1989	2,263303	0,5752831	3,93	0	1,1335310 3,393075
1990	2,079300	0,5606457	3,71	0	0,9782733 3,180326
1991	1,970552	0,5829938	3,38	0,001	0,8256372 3,115467
1992	1,297156	0,5765315	2,25	0,025	0,1649326 2,429380
1993	1,642262	0,5741315	2,86	0,004	0,5147517 2,769773
1994	1,182737	0,5625119	2,10	0,036	0,0780452 2,287428
1995	1,276564	0,5468749	2,33	0,02	0,2025820 2,350547
1996	1,253175	0,5767419	2,17	0,03	0,1205385 2,385812
1997	1,778777	0,5512081	3,23	0,001	0,6962853 2,861270
1998	1,658609	0,5484073	3,02	0,003	0,5816173 2,735601
1999	1,795752	0,5537428	3,24	0,001	0,7082816 2,883222
2000	1,842128	0,5432954	3,39	0,001	0,7751748 2,909081
2001	1,706270	0,5464024	3,12	0,002	0,6332154 2,779325
2002	1,760065	0,5513479	3,19	0,001	0,6772985 2,842832
2003	1,453939	0,5678786	2,56	0,011	0,3387087 2,569170
2004	1,684203	0,5884109	2,86	0,004	0,5286498 2,839756
2005	1,890441	0,5529778	3,42	0,001	0,8044735 2,976409
2006	2,212226	0,5477860	4,04	0	1,1364550 3,287998
2007	2,115248	0,5605655	3,77	0	1,0143790 3,216117
2008	2,155591	0,5541383	3,89	0	1,0673440 3,243838
2009	1,785420	0,5745262	3,11	0,002	0,6571339 2,913705
2010	2,225715	0,5559227	4,00	0	1,1339640 3,317466
2011	1,858589	0,5734680	3,24	0,001	0,7323812 2,984796

<i>2012</i>	2,037978	0,5730891	3,56	0	0,9125145	3,163441
<i>2013</i>	2,082907	0,5499013	3,79	0	1,0029810	3,162833
<i>2014</i>	1,647942	0,5712191	2,88	0,004	0,5261514	2,769733
<i>2015</i>	2,072591	0,5430241	3,82	0	1,0061710	3,139011
<i>2016</i>	2,073231	0,5532852	3,75	0	0,9866591	3,159802
<i>2017</i>	1,483682	0,5568336	2,66	0,008	0,3901420	2,577222
<i>2018</i>	1,555243	0,5487613	2,83	0,005	0,4775556	2,632930
<i>2019</i>	1,590130	0,6497689	2,45	0,015	0,3140789	2,866182
<i>Male</i>	-0,1791485	0,0907959	-1,97	0,049	-0,3574583	-0,0008387
<i>Notorious Names</i>	0,3066749	0,0882567	3,47	0,001	0,1333517	0,4799981
<i>Length</i>	0,0245415	0,0095310	2,57	0,01	0,0058240	0,0432591
<u><i>Length2</i></u>	-0,0000485	0,0000670	-0,72	0,47	-0,0001800	0,0000830
<i>Width</i>	0,0088122	0,0108599	0,81	0,417	-0,0125150	0,0301394
<u><i>Width2</i></u>	0,0000935	0,0000749	1,25	0,212	-0,0000536	0,0002405
<i>Provenance</i>	0,2296182	0,1366055	1,68	0,093	-0,0386551	0,4978914
<i>Exhibition</i>	0,5282753	0,1193458	4,43	0	0,2938976	0,7626531
<i>Signature</i>	0,3324329	0,1955736	1,70	0,09	-0,0516452	0,7165109
<i>Stamp</i>	-0,0379311	0,1886103	-0,20	0,841	-0,4083342	0,3324720
<i>Oil/canvas</i>	2,4050090	0,3194861	7,53	0	1,7775850	3,0324330
<i>Oil/other</i>	1,8481880	0,3094145	5,97	0	1,2405430	2,4558330
<i>Pencil/paper</i>	-0,2060320	0,1858562	-1,11	0,268	-0,5710265	0,1589625
<i>Watercolour/paper</i>	-0,1010035	0,2155696	-0,47	0,64	-0,5243507	0,3223436
<i>Ink/paper</i>	-0,3193762	0,2019730	-1,58	0,114	-0,7160218	0,0772694
<u><i>Signed Drawings</i></u>	-0,5533346	0,2027847	-2,73	0,007	-0,9515741	-0,1550951
<u><i>Signed Oils</i></u>	0,1477579	0,3092344	0,48	0,633	-0,4595334	0,7550492
<i>Signed Nudes</i>	0,0482873	0,1770323	0,27	0,785	-0,2993784	0,3959530
<u><i>Nude Drawings</i></u>	-0,0146077	0,2038507	-0,07	0,943	-0,4149408	0,3857254
<u><i>Nude Oils</i></u>	-0,5525582	0,3010181	-1,84	0,067	-1,1437140	0,0385974
<u><i>Paris/Soth</i></u>	-0,1335905	0,2488671	-0,54	0,592	-0,6223292	0,3551482
<u><i>Ldn/Soth</i></u>	0,6263220	0,1225468	5,11	0	0,3856581	0,8669860
<u><i>Ny/Soth</i></u>	0,3803473	0,1078174	3,53	0	0,1686097	0,5920850
<u><i>Paris/Chris</i></u>	0,3182507	0,2791301	1,14	0,255	-0,2299201	0,8664216
<u><i>Ldn/Chris</i></u>	0,3658801	0,1282750	2,85	0,004	0,1139668	0,6177935
<u><i>NyChris</i></u>	0,4636638	0,1321157	3,51	0	0,2042078	0,7231197
<u><i>_cons</i></u>	7,6150930	0,6102408	12,48	0	6,4166690	8,8135160

Appendix 4: Regression Model with Avg Estimated Price

Source	SS	df	MS	Number of obs = 847
Model	2598,50381	62	41,9113518	F(62, 784) = 74,57
Residual	440,616893	784	0,562011343	Prob > F = 0,0000
Total	3039,12071	846	3,59234126	R-squared = 0,8550
				Adj R-squared = 0,8436
				Root MSE = 0,74967

LnAdjEstPrice	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
<i>Female Nude</i>	0,463849	0,1541612	3,01	0,003	0,1612310 0,7664663	
<i>Year of Sale</i>						
1985	0,060037	0,5957331	0,1	0,92	-1,1093830 1,229458	
1986	0,717239	0,5839797	1,23	0,22	-0,4291099 1,863588	
1987	0,780958	0,5701336	1,37	0,171	-0,3382108 1,900127	
1988	0,840347	0,5692213	1,48	0,14	-0,2770309 1,957725	
1989	1,360028	0,6052869	2,25	0,025	0,1718533 2,548203	
1990	1,648588	0,6031100	2,73	0,006	0,4646860 2,832489	
1991	1,571167	0,7678574	2,05	0,041	0,0638669 3,078466	
1992	0,814685	0,6346375	1,28	0,2	-0,4311045 2,060475	
1993	1,005417	0,5868823	1,71	0,087	-0,1466302 2,157463	
1994	0,755700	0,5781637	1,31	0,192	-0,3792325 1,890632	
1995	0,793383	0,5719327	1,39	0,166	-0,3293180 1,916083	
1996	0,589504	0,5832824	1,01	0,312	-0,5554759 1,734485	
1997	1,169507	0,5702086	2,05	0,041	0,0501902 2,288823	
1998	1,165489	0,5641450	2,07	0,039	0,0580752 2,272902	
1999	1,348134	0,5628933	2,4	0,017	0,2431780 2,453091	
2000	1,334242	0,5640134	2,37	0,018	0,2270872 2,441398	
2001	1,222560	0,5630346	2,17	0,03	0,1173259 2,327793	
2002	1,425338	0,5673617	2,51	0,012	0,3116102 2,539066	
2003	1,336603	0,5783595	2,31	0,021	0,2012865 2,471919	
2004	1,347906	0,5764868	2,34	0,02	0,2162656 2,479546	
2005	1,195955	0,5708750	2,09	0,036	0,0753303 2,316579	
2006	1,562519	0,5670920	2,76	0,006	0,4493207 2,675717	
2007	1,608392	0,5679120	2,83	0,005	0,4935840 2,723200	
2008	1,622958	0,5652100	2,87	0,004	0,5134536 2,732462	
2009	1,622933	0,5697461	2,85	0,005	0,5045248 2,741342	
2010	1,553501	0,5680257	2,73	0,006	0,4384698 2,668532	
2011	1,380876	0,5806487	2,38	0,018	0,2410661 2,520687	

<i>2012</i>	1,570736	0,5748172	2,73	0,006	0,4423727	2,699099
<i>2013</i>	1,450856	0,5670163	2,56	0,011	0,3378061	2,563906
<i>2014</i>	1,421304	0,5733081	2,48	0,013	0,2959039	2,546705
<i>2015</i>	1,460907	0,5674534	2,57	0,01	0,3469991	2,574815
<i>2016</i>	1,483042	0,5715345	2,59	0,01	0,3611233	2,604961
<i>2017</i>	1,002629	0,5727248	1,75	0,08	-0,1216262	2,126885
<i>2018</i>	1,216563	0,5684617	2,14	0,033	0,1006761	2,332450
<i>2019</i>	1,191487	0,6480401	1,84	0,066	-0,0806118	2,463586
<i>Male</i>	-0,115105	0,0668331	-1,72	0,085	-0,2462980	0,016088
<i>Notorious Names</i>	0,2361955	0,0666205	3,55	0	0,1054197	0,3669712
<i>Length</i>	0,0182056	0,0072621	2,51	0,012	0,0039503	0,0324610
<i><u>Length2</u></i>	9,40E-06	0,0000524	0,18	0,858	-0,0000935	0,0001123
<i>Width</i>	0,0196435	0,0088749	2,21	0,027	0,0022222	0,0370648
<i><u>Width2</u></i>	-6,40E-06	0,0000738	-0,09	0,931	-0,0001513	0,0001385
<i>Provenance</i>	0,0323602	0,1131391	0,29	0,775	-0,1897313	0,2544516
<i>Exhibition</i>	0,3835857	0,0938403	4,09	0	0,1993776	0,5677937
<i>Signature</i>	0,2363248	0,1422082	1,66	0,097	-0,0428290	0,5154787
<i>Stamp</i>	0,0688496	0,1420429	0,48	0,628	-0,2099797	0,3476790
<i>Oil/canvas</i>	2,1787170	0,2561434	8,51	0	1,6759090	2,6815250
<i>Oil/other</i>	1,7884760	0,2883723	6,20	0	1,2224030	2,3545490
<i>Pencil/paper</i>	-0,3096837	0,1466468	-2,11	0,035	-0,5975506	-0,0218168
<i>Watercolour/paper</i>	-0,1924903	0,1606737	-1,20	0,231	-0,5078919	0,1229112
<i>Ink/paper</i>	-0,3415975	0,1493756	-2,29	0,022	-0,6348209	-0,0483741
<i><u>Signed Drawings</u></i>	-0,4012902	0,1507136	-2,66	0,008	-0,6971402	-0,1054402
<i><u>Signed Oils</u></i>	0,2719340	0,2486490	1,09	0,274	-0,2161627	0,7600306
<i><u>Signed Nudes</u></i>	0,0576136	0,1359697	0,42	0,672	-0,2092942	0,3245214
<i><u>Nude Drawings</u></i>	-0,1034833	0,1566984	-0,66	0,509	-0,4110815	0,2041148
<i><u>Nude Oils</u></i>	-0,6655836	0,2506452	-2,66	0,008	-1,1575990	-0,1735685
<i><u>Paris/Soth</u></i>	-0,1113022	0,1913024	-0,58	0,561	-0,4868277	0,2642233
<i><u>Ldn/Soth</u></i>	0,3075510	0,0942728	3,26	0,001	0,1224940	0,4926080
<i><u>Ny/Soth</u></i>	0,2697684	0,0873907	3,09	0,002	0,0982210	0,4413159
<i><u>Paris/Chris</u></i>	0,0839928	0,2172047	0,39	0,699	-0,3423788	0,5103643
<i><u>Ldn/Chris</u></i>	0,2209933	0,1045538	2,11	0,035	0,0157548	0,4262318
<i><u>NyChris</u></i>	0,2867251	0,1097851	2,61	0,009	0,0712176	0,5022327
<i>_cons</i>	8,2719450	0,6019196	13,74	0	7,0903800	9,4535100

Appendix 5. Other Model Specifications: Quantile Regression

Tables A Quantile Regressions for Hammer Price Model

Table A.1 .25 Quantile Regression

Raw sum of deviations 339,6625 (about 10,29)
 Min sum of deviations 166,9005
 Number of obs = 674
 Pseudo R2 = 0,5086

LnAdjHamPrice	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
<i>Female Nude</i>	0,8845143	0,2800027	3,16	0,002	0,3346298	1,434399

Table A.2. .75 Quantile Regression

Raw sum of deviations 510,9575 (about 12,57)
 Min sum of deviations 159,5966
 Number of obs = 674
 Pseudo R2 = 0,6877

LnAdjHamPrice	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
<i>Female Nude</i>	0,5300127	0,240389	2,2	0,028	0,0579237	1,002102

Tables B. Quantile Regressions for Avg Estimated Price Model

Table B.1. .25 Quantile Regression

Raw sum of deviations 382,5826 (about 10,355777)		Number of obs = 847				
Min sum of deviations 190,6491		Pseudo R2 = 0,5017				
LnAdjEstPrice	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
<i>Female Nude</i>	0,7584545	0,2433296	3,12	0,002	0,2807999	1,236109

Table B.2. .75 Quantile Regression

Raw sum of deviations 591,8282 (about 12,158178)		Number of obs = 847				
Min sum of deviations 178,1303		Pseudo R2 = 0,6990				
LnAdjEstPrice	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
<i>Female Nude</i>	0,5074432	0,1869155	2,71	0,007	0,1405291	0,8743572

Appendix 6. – Other Model Specifications: Regression with US CPI

Table A. Regression with US CPI for Hammer Price Model

Source	SS	df	MS	Number of obs = 674
Model	2395,4124	62	38,6356926	F(62, 611) = 52,22
Residual	452,099682	611	0,739934013	Prob > F = 0,0000
Total	2847,5162	673	4,23107373	R-squared = 0,8412
				Adj R-squared = 0,8251
				Root MSE = 0,86019

LnAdjHamPrice	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
<i>Female Nude</i>	0,5809803	0,1998735	2,91	0,004	0,1884579 0,9735027

Table B. Regression with US CPI for Avg Estimated Price Model

Source	SS	df	MS	Number of obs = 847
Model	2620,48241	62	42,2658454	F(54, 619) = 73,41
Residual	451,365107	784	0,575720799	Prob > F = 0,0000
Total	3071,84752	846	3,63102544	R-squared = 0,8531
				Adj R-squared = 0,8414
				Root MSE = 0,75876

LnAdjEstPrice	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
<i>Female Nude</i>	0,4322847	0,1560302	2,77	0,006	0,1259983 0,738571