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THE ECONOMICS OF VIEIRA DA SILVA

Francisco Maria Neppach da Veiga Sanches Delerue

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A Project carried out with the supervision of:

Miguel Lebre de Freitas

and

Luís Catela Nunes

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Abstract

This paper investigates the time valuation and the age valuation profile of art-works created by the Portuguese female painter Maria Helena Vieira da Silva. It uses data from records from her paintings auction sales between 1986 and 2014, taken from Artprice.com. The study explores three aspects regarding her artistic career: (1) estimation of Age-valuation profile, defining her creativity pattern and the age at which she produced her most valuable paintings; (2) estimation of time valuation profile, through a creation of an individual hedonic price index for Vieira da Silva; (3) internationalization phenomenon of the artist, investigating whether selling prices are primarily set in euros or in US dollar.

The results suggest that Vieira da Silva peaked quite early in her career; her paintings prices are not very sensible to economic cycles and tends to slightly increase afterlife; the empirical results are not suggestive on which currency is the best predictor of her paintings' price.

I. Introduction

In the last few years, there has been an increasing interest in the economics of the market for fine art. Galenson has introduced a way to measure how the relationship between a worker's productivity varying with his age, applying it to painters. Moreover, several economists studied the fine art market on a more financial perspective, by creating price indices for this market or at least for a group of successful artists in order to comprehend price evolution of paintings auctioned. In particular, Czujack was responsible for the creation of a price index for a single artist. In this paper, we will apply these concepts and methods to the Portuguese artist, Maria Helena Vieira da Silva, in order to deeper comprehend her artistic career as a painter.

Maria Helena Vieira da Silva was born on 13th June 1908 in Lisbon, Portugal. She studied in fine-arts academy in Lisbon since 11 years old. In 1928 she moved to Paris, France. During the Second World War, Vieira da Silva lived in Brazil, returning back to Paris later on, where she resided for the rest of her life, naturalizing herself French in 1956. She died in 6th March 1992.

This paper is focused on Vieira da Silva's artistic career. The objects of study are to explore the nature of her artistic creative process, tracing out her age-valuation profile; to analyse the time value of her artworks, through the creation of an individual hedonic price index. Using this price index, we evaluate the risk-return characteristics of her paintings as an investment opportunity; we also investigate if the price of her paintings is anchored in US dollars or in Euros, once she is an European artist and her paintings were sold in dollars, as it usually happens amongst art auction houses. To fulfil these research questions, the data used are the records of auction

sales of all Vieira da Silva's paintings, from 1986 to 2014, across more than 50 auction houses.

In order to address these objects of study, we will estimate four hedonic price regressions, based on auction sales, that will permit to trace the age valuation profile, to create the Vieira da Silva paintings' price index and to evaluate the characteristics that most affect her auctioned paintings' price.

The rest of the paper has the following order: Section II reviews the literature, which explores the previous studies focused on the economics of art; Section III is the description of the data set utilized and the econometric analysis applied to the data; Section IV presents the empirical results from the estimated regressions; Section V is the analysis and interpretation of Vieira da Silva's creative pattern; Section VI is the analysis on the time valuation on Vieira da Silva's hedonic price index; Section VII contains the analysis on the internationalization phenomenon; Section VIII provides an overall conclusion and refers the main limitations of this study.

II. Literature Review

II.I Creativity process

The creative process of artists is a theme, firstly, introduced in the economic studies, by a series of works from the American economist, David Galenson (1997, 1999, 2001), adding to this list Galenson and Weinberg (2000) and Galenson and Jensen (2002). In this literature, paintings' auction prices were used as data to estimate regressions in order to investigate creativity patterns for American and French artists from both the 19th and 20th centuries. Following closely Galenson's papers, Sebastian Edwards (2004) applied the same methods to discover creativity patterns for Latin American Art. More recently, John Galbraith and Douglas Hodgson (2009, 2014) and

Douglas Hodgson (2011), explored the same theme as Galenson, very much based on his studies as well, and applied it to Canadian painters.

Galenson objective was to determine at what age painters did their most important or valuable works of art, just like economists previously studied how workers' productivity would vary with age. In order to figure out the productivity of painters, Galenson used records of paintings sold at auctions, being each painting sold a single observation to estimate a hedonic price regression, having the natural logarithm of the sale price in dollars (converted to constant terms of 1983 dollars using the CPI) of each painting sold as the dependent variable. The independent variables used were: a polynomial of the age of the artist when executed the painting sold; a binary variable for the painting's support (paper or canvas); the size of the painting by calculating the work's surface area; and a dummy for the year at which the painting was sold. By applying this method, Galenson is able to relate prices for a particular artist and the artist's age when the painting was executed. Analysing the obtained results from his study, he distinguishes two different patterns of creativity among the included artists in the sample: Experimental artists, who do each painting as an experiment without greater planning (Galenson gives the example of Paul Cezanne); and Conceptual artists, who firstly conceive ideas, study and sketch them before applying it in their paintings (Galenson's example of a conceptual artist is Pablo Picasso). Regarding age-valuation profiles, Experimental artists are those who tend to peak late in their careers, doing their most valuable work at an older age (Cezanne peaking at the age of 67). On the other hand, Conceptual artists are the ones that tend to do their best work early in their careers, at a younger age (Picasso peaking at the age of 26).

Furthermore, it is important to state that Galenson findings, through the analysis of auction sales data, conform the opinions of scholarly works by art historians and art

critics. Galenson argues that his estimation procedure results produce very similar information on artists' more productive periods and most valuable works as the information given by the art experts.

II.II Art as an Investment – Hedonic Price Index

There are several studies based on hedonic prices indices for wide variety of art portfolios, such as: paintings in general, English painters, Non-English painters, Dutch painters, Italian painters, Latin American painters and impressionists; from studies such as Anderson (1974), Buelenes and Ginsbourgh (1993), Chanel et. al (1996), Barre et. al (1996). However, in this particular case, the interest of the study falls on a particular artist, like Czujack (1997), where he calculated the rate of return of Picasso paintings at auction, since 1963 to 1994. For this, the author estimated a hedonic price regression based on Chanel et al. (1996), where the dependent variable is the logarithm of the price of a specific painting sold, the independent variables are a time-invariant idiosyncratic attribute of the painting (for example the dimensions of a painting), a time varying characteristic (for example the changing owner of a painting) and a market-wide price effect variable. The coefficients of the prices of the characteristic-free works of each period are used to construct the price index.

No hedonic price index was ever estimated for this purpose for a single Portuguese artist.

III. Data and Econometric Analysis

The data analysed in this paper is drawn from international auctions of Portuguese paintings, held from 1986 to 2014. The source of these data is the "Artprice.com" website, which compiles, in total auction prices for works of art of around 576,964 different artists around the world. This study uses records of all auction sales, from

1986 to 2014, for the Portuguese artist, Vieira da Silva, in the single category of paintings. These auctions occurred throughout Europe (Paris, London, Lisbon, Milan, Amsterdam, Versailles, Bern, Munich, Zurich, Lille, Lyon, Angers, Neuilly-sur-Seine, Limoges, Vienna, Crissier, Rome, Deuil-la-Barre and Brussels) and the United States (New York, Los Angeles and Dallas), from more than 50 different Auction Houses, being the main ones Sotheby's and Christie's, who dominate the art auction market.

The considered works of art are used as observations, and include media such as tempera, oil, ceramic tiles and mixed media; and supports like paper, canvas and tiles. The most used media is oil (73%) and the most used support is canvas (second one being paper). This amounted to a total of 327 sales of individual works. Most of these sales occurred in Europe (around 95%), and mainly sold in Paris (40% of auction sales) and London (38% of auction sales). The main auction houses that sold her works of art were Christie's (around 31%) and Sotheby's (around 25%). Only 16 auction sales were recorded in Lisbon, by the following auction houses: Cabral Moncada Leilões, Christie's, Veritas and Palácio do Correio Velho.

Table 1: Summary and Descriptive Statistics for Vieira da Silva

Number of paintings sold in auctions	327
Median age of paintings executed	52
Median year of paintings executed	1960
Most number of paintings executed in one year	15
Average paintings per year	5.5
Age in year with more paintings executed	46
Average age of paintings execution	54
Years with more paintings sold	2013
Maximum price in US dollars	$ 1 844 748.00
Minimum price in US dollars	$ 502.00
Average paintings' price in US dollars	$ 145 505.70
Median price in US dollars	$ 72 934.00
Percentage of paintings using oil	73.09%
Percentage of paintings using tempera	25.08%
Percentage of paintings in canvas	68.20%
Percentage of paintings in paper	18.35%

For each work of art present in the data set, it was recorded the respective media, support, size (in inches), date of execution, date when sold, sale price (in US dollars), responsible auction house for the sale, location of the auction and if the painting has a signature by the artist.

Regarding the econometric analysis, each work of art sold represents a single observation. An individual hedonic price regression is estimated for Maria Helena Vieira da Silva's auctioned paintings[1], where the dependent variable of the regression is the natural logarithm of the sale price in dollars, in constant terms of 1999. Once one of the interests of this study is the impact of artist's age when executed the work of art on its auction price, the estimated regression uses age variable as a fourth degree polynomial independent variable, which was the one with best fit and singly significant among the four regressions initially considered (1) using age as independent variable, (2) age and its square, (3) age, its square and its cube, (4) age, its square, its cube and its quad. The size of the works of art was introduced in the regression through the natural logarithm of the work of art's area (previously calculated by multiplying its height and width) as an independent variable. Several binary variables regarding the media and support were created to increase the fit of the regression. For Vieira da Silva's estimation, those variables ended up to be dummies for canvas, paper, oil and tempera, meaning they are given the value one for each of these characteristics the observation meets, or zero otherwise. There were dummies included for the first four Auction Houses with more of her paintings sold, namely Christie's, Sotheby's, Artcurial and Briest. A binary variable was introduced

[1] As Vieira da Silva paints dominantly using oil in canvas, and as these are the most valuable paintings in data, the same regression was applied to a shorter sample focused only in Oil in Canvas paintings, for robustness purposes.

in the model for the location of auction sales, given the value 1 if the sale was in Europe and zero if it was in the US. To control for art market and economic fluctuations during the data range of 1986 to 2014, it was introduced another binary independent variable, that indicates the year at which the work of art was auctioned or sold. The year of sale binary variables were submitted to an F-test, in order to guarantee that they were jointly statistically significant. There is also an independent variable, named θ, for the real exchange rate between US dollars and Euros, to study the possibility of an internationalization phenomenon. An afterlife dummy was thought to be included in the model, to observe the possibility of an increase in the valorisation of the artist paintings after her death in 1992, however, the inclusion of this variable would rise collinearity issues related with the year of sale binary variables. Making it impossible to estimate the afterlife effect that would intermingle with time effect. The internationalization phenomenon is the possibility that the prices for an European artist are anchored in US dollars, in other words, if the paintings' prices are set up in US dollars as a result of Vieira da Silva's works of art worldwide spread or firstly, set up in euros and afterwards transformed into US dollars, once the last is the main currency used in the fine art auction sales. Depending on the value of the θ coefficient, if β_{16} is equal to zero it means that the data is better explained in US dollars, on the other hand if β_{16} is equal to one, it is better explained in euros. Giving birth to the following baseline model (1) presented below, which afterwards was submitted to a few transformations to increase significance of variables.

$$(1) \quad ln(price_{\$})_i = \beta_0 + \beta_1 age_i + \beta_2 age_i^2 + \beta_3 age_i^3 + \beta_4 age_i^4 + \beta_5 ln\ area_i + \beta_6 canvas_i + \beta_7 paper_i + \beta_8 oil_i + \beta_9 tempera_i + \beta_{10} signature_i + \beta_{11} Christies_i + \beta_{12} Sothebys_i + \beta_{13} Artcurial_i + + \beta_{14} Briest_i + \beta_{15} LocationEU_i + \beta_{16}\theta_i + \sum_{y=1986}^{2014} \alpha_y I(saleyear_i = y) + \epsilon_i$$

IV. Empirical Results

In this section, the empirical results from the four estimated regressions are presented and interpreted. Estimation results are displayed in table 2.

Model (1) is the baseline model presented in section III, which has all variables created for this study. Model (2) is a simple variation of model (1), where the real exchange rate variable, θ, which is not significant, was divided in two other variables contemplating two different periods: first period from 1986 until 1999 included (containing 14 years) originating the variable $\theta pre99$; and the second period from 2000 until 2014 (containing 15 years) creating the second variable, $\theta post99$ (the division was made through the median year of sales). This double variable creation was done with the intent to gain deeper understanding about the real exchange rate influence in Vieira da Silva paintings' prices and if that influence differs from one period to another.

In Model (3), real exchange rates are dropped, as well as, dummies for auction houses, because these variables were not showing any significance (neither joint significance for auction houses variables). Other variables, such as Location EU and Signature were left in the model to see if their impact would differ from the previous regressions, or if their statistical significance had improved, however, it did not. Media and support dummies stayed in this version of the model, because all the four variables have been jointly significant. Model (4) contains all the significant variables.

Table 2 – Estimated Regressions' Results

Variables	*(1) coefficients (Robust S.E.)*	*(2) coefficients (Robust S.E.)*	*(3) coefficients (Robust S.E.)*	*(4) coefficients (Robust S.E.)*
constant	-31.410 (5.780)	-31.579 (5.753)	-32.301 (5.532)	-33.695 (5.890)
θ	.501 (.907)			
$\theta pre99$		.953 (1.710)		
$\theta post99$		.310 (.980)		
Age	2.775 (.488)	2.778 (.488)	2.832 (.480)	2.999 (.515)
Age^2	-.081 (.015)	-.081 (.015)	-.083 (.015)	-.088 (.016)
Age^3	.001 (.0002)	.001 (.0002)	.001 (.0002)	.001 (.0002)
Age^4	-4.55e-06 9.76e-07	-4.56e-06 (9.76e-07)	-4.66e-06 (9.70e-07)	-4.98e-06 (1.06e-06)
Ln(area)	.605 (.052)	.606 (.051)	.619 (.048)	.624 (.044)
Sotheby's	.068 (.106)	.068 (.106)		
Christie's	.125 (.109)	.125 (.109)		
Artcurial	-.113 (.134)	-.116 (.133)		
Briest	.217 (.148)	.219 (.150)		
Location EU	.083 (.144)	.091 (.149)	.044 (.142)	
Paper	.086 (.178)	.089 (.174)	.056 (.178)	
Canvas	.465 (.183)	.465 (.182)	.455 (.181)	.657 (.092)
Oil	.560 (.479)	.569 (.478)	.589 (.483)	
Tempera	.269 (.456)	.277 (.460)	.304 (.471)	
Signature	.060 (.420)	.076 (.411)	.061 (.448)	
Year of sale dummies	√	√	√	√
Adjusted R^2	0.7750	0.7751	0.7713	0.7666

Throughout the estimations, it is possible to observe that the area influence positively the paintings price, in this way, the price of the painting increases with the increasing of the surface area.

Regarding techniques, media and support, oil paintings tend to be more expensive than paintings with other materials. The same happens with canvas in comparison to other materials like paper. Observing the coefficients of oil against tempera[2] and canvas against paper[3], the oil coefficients as well as the canvas coefficients always remain higher than the others, confirming this reasoning.

Signature is an important characteristic of a painting for the costumers, once it proves its authenticity. It was expected to improve the paintings price, however, in every estimation was not statistically significant, so it does not seem to influence the price.

The Location EU variable was introduced in the model, in order to see if the location where the auction took place would influence the paintings' price. Although, the result presents a positive coefficient for sales located in Europe, it was not significant. Similar results were obtained for auction house dummies. Sotheby's, Christie's and Briest coefficients' are positive, in contrast, Artcurial coefficient is negative, however, as these variables are not significant, it seems they do not affect the price of a Vieira da Silva's painting.

V. Age-Valuation Profile and Creativity Pattern

The main question of interest here is, if possible, to identify at what age Vieira da Silva did her most important and valuable work. To fulfil this purpose regression (4)

[2] Baseline equation with oil and tempera binary variables equal to zero refers to other styles of media used, such as ceramic tiles or mixed media.

[3] Baseline equation with canvas and paper binary variables equal to zero refers to the usage of tiles as support for the painting.

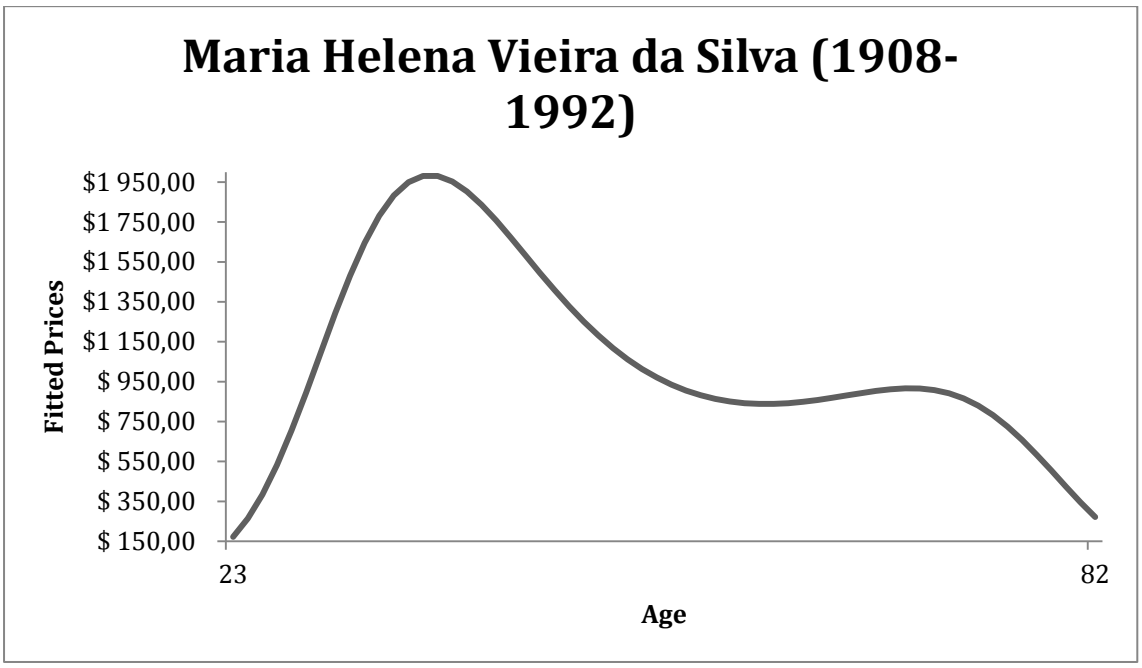
equation was used, because this version of the model eliminates the non-significant variables from previous regressions, empowering age coefficients relevance in the model, which are in the centre of the age-valuation profile creation.

The age polynomial coefficients, $\beta_1, \beta_2, \beta_3 \; and \; \beta_4$, are essential to determine the artist's Creativity Pattern, which is the relation between the artist's age when the painting was executed and the painting's price. To determine the polynomial order, estimations were made with polynomials of degree 1 to 4, choosing the one where all the estimated coefficients were significant, according to p-value with 95% confidence interval. Additionally, the age coefficients were submitted to an F-test that proves they are statistically joint significant. Moreover, the estimated regression with 4 polynomial degrees was the one that best fitted, with an adjusted R^2 of 0.7666. Table 3 presents the annual estimated prices, calculated from model (4) regression's coefficients, for the 60 years of Vieira da Silva's career, at the logarithm of the average painting area (around 752 squared inches), considering the paintings are on canvas, and for works sold in the year 2013.

Table 3, presents the years referent to Vieira da Silva's career (from 1931 to 1990), the correspondent artist's age for those years, as well as the number of paintings she completed in each age and the estimated price of an auctioned painting for each year of her career.

Overall, Silva's sold paintings amounted to 327 in total from 60 years of her career, giving an average of 5.5 illustrations per year. Table 3, shows that from ages 32-42 are the ten years of her career with the highest estimated prices, including a total amount of 32 paintings executed during this time. On the other hand, the ten years with lowest estimated prices are from ages 23-26 and 77-82, amounting to a total of six paintings executed. These results are easily observed in Figure 1.

Figure 1 – Vieira da Silva's age-valuation profile



The age valuation profile figure 1[4] traces the hypothetical auction prices of a series of paintings, of identical size (mean size of her paintings) and a chosen year of sale (2013), presenting the estimated age-price profile for the Vieira da Silva. The horizontal axis refers to the artist's age and it is bounded by the minimum (23) and maximum (82) ages appeared in the sample analysed, defining the beginning and the end of her career, respectively; the vertical axis presents the fitted prices. Firstly, her profile rises with age until it reaches the peak of her valuation at the age of 36[5], only thirteen years after the beginning of her career; then it declines until the age of 60,

[4] The age valuation profile was also calculated for Oil in Canvas sample and it is presented in figure 3 of the appendix. In this estimation, the shape of the relationship between the artist productivity varying with age is very close with figure 1.

[5] In the estimation using only Vieira da Silva's auctioned Oil in Canvas paintings, she peaks at the age of 37, just one later, compared to the estimation using all auctioned paintings.

starting to increase more smoothly until the age of 70, when it turns to a continuously declining until the end of her artistic career at 82, two year before her death. These results show that the most valuable work was produced during the first half of her career, around the age of 35 and 39, peaking quite early in her career. Moreover, it was at the age of 40, very close to her peak that she painted her fourth more expensive painting, "Souterrain". Vieira da Silva's most expensive painting ever sold at an auction, "Saint-Fargeau", was executed at the age of 57, which is roughly the age at which her age valuation profile turns over for the second uprising.

Furthermore, if the creativity pattern measured here is extended to Galenson's creativity patterns' classification, Vieira da Silva would be characterized as a conceptual artist that produces the most valuable work earlier in the career, peaking at a younger age.

VI. Time-Valuation Profile

In order to evaluate the price evolution of Vieira da Silva's auctioned paintings, a hedonic price index is created through the estimated model (1), for the last twenty years (from 1994 to 2014). To construct Vieira da Silva's index the α coefficients from model (1) are used. These are the coefficients from the sale year dummies, which establish the relationship and impact that each sale year has on the natural logarithm of prices, while maintaining the other variables constant. The α coefficient of the first considered year, 1994, is normalized to 100, and the other sale year coefficients are adjusted accordingly, giving birth to Vieira da Silva Index. This index will permit to analyse her paintings market behaviour throughout the years.

Moreover, to better understand its evolution regarding the art market behaviour the index is compared to the Portuguese Art Price Index, created by Antunes (2015). On

the other hand, VS Index is also related to the PSI20 Index, which represents the Portuguese benchmark stock market index, to observe the correlation between Vieira da Silva's paintings prices and the Portuguese economic cycle. All three indices are presented below on figure 2.

Figure 2 – Vieira da Silva Index, Portuguese Art Price Index and PSI20 Index

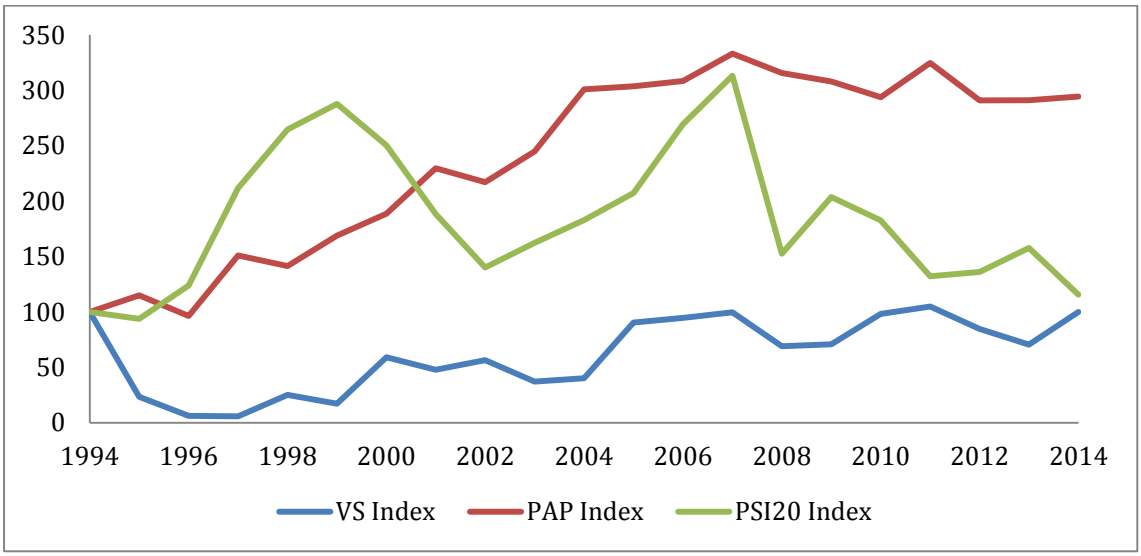


Figure 2, represents the two art price indices, the Portuguese Art Price index (PAP Index) and the individual index for Vieira da Silva (VS Index), and the PSI20 Index. As it is visible in figure 2, Vieira da Silva's Index suffers a continuously declining in the 90's, having only two breaks between 1997 and 1998 and between 1999 and 2000, when it increases smoothly. From 2000 to 2004, the index oscillates considerably. Afterwards it increases continuously until 2007, being the biggest period of growth in prices. From 2007 to 2014 it oscillates from year to year, reaching its peak at the last year.

Vieira da Silva's Index follows closely the Portuguese Art Price index evolution, behaving very similarly, when the prices for the Portuguese paintings market rise,

Vieira da Silva's paintings prices tend to rise as well, however, with less intensity and with some breaks in periods of more continuous risings for the PAP Index. For example, taking into consideration the five-year time interval from 2002 and 2007, where the VS Index suffers a minor decrease from 2002 to 2003, and only afterwards starts increasing again until 2007 compared with a continuous increase in the PAP Index. Moreover, every time the Portuguese Art Price index suffers a break in its growth, Vieira da Silva's index also suffers the same break, usually with more intensity, but it reacts quicker to the break, oscillating between years of continuous declining for the PAP index.

When relating VS index with the Portuguese economic cycle, as in figure 2, the index tends to behave countercyclical, especially in the 90's. Suggesting that buying Vieira da Silva's paintings is a good investment when economy is on a downturn, meaning its prices resist to more troubled economic periods. On the other hand they do not rise as much as expected when economy goes through healthier periods of growth. However, there is a major exception during the financial crisis in US in 2007-2008 that affected the three indices with greater impact. All the indices were facing an increasing growth rate until 2007, when they started feeling the economic crisis, which lead them three to a very aggressive downturn from 2007 to 2008, as it was economically expected. During the latest years, from 2009 on the PSI20 and the PAP indices behave very similarly, confirming the impact of economic crisis that Portuguese economy felt until 2011, that lead to them IMF intervention within the country. However, the financial crisis impact is much more smooth in the VS Index, which starts growing again in 2009, seeming to resist with more efficiency to the economic downturns over the years of 1994 to 2014, making the artist more insensible in relation to the economic cycle. In this way, Vieira da Silva is a safer

investment for economic downturns, once her paintings do not tend to depreciate much during economic crisis. There is also a slight tendency for Vieira da Silva's works of art to valorise very smoothly over the years.

Overall, Vieira da Silva's Index has zero returns over the last twenty years, and it presents a very high volatility around 100%. In contrast, the Portuguese Art Price Index presents a volatility of 16% with returns around 5% for the same range period. These results follow the diversification tendency of investments portfolios implying that diversified portfolios perform better than investments on single assets.

The same index was estimated using 2000 as base year (figure 4 exhibited in the appendix), and it presents very similar results. Its real returns are also around 0%, however, the volatility is instead 43%, indicating that most of the VS Index volatility is present in the 90's. Figure 4 also presents Vieira da Silva's Index only for auctioned paintings using Oil in Canvas (based in the year 2000). This index presents returns of 0.77%, which compared to the other VS Indices, do not disperse that much. Although, the volatility of Oil in Canvas paintings' auctioned price is even lower (22%).

VII. Internationalization Phenomenon

Once Vieira da Silva is a European artist it is interesting to determine which currency between US dollar and Euro, better predicts the real price behind the auction sales price.

For this purpose, the θ coefficient, β_{16}, in model (1) was tested to be equal to zero (dollar explained) and afterwards to be equal to one (euro explained). The test results were $p - value = 0.5810$ and $p - value = 0.5826$, respectively. In this way, both tests fail to reject the null hypothesis of $\beta_{16} = 0$ and $\beta_{16} = 1$, not showing statistical

significance of the coefficient value being more close to zero or one. As it was not possible to arrive at a conclusion regarding the best predicting currency of the artist's paintings from model (1), model (2) was used instead. In model (2), the real exchange rate variable is divided in two other variables as it is previously explained in section IV. The $\theta pre99$ coefficient is 0.953, which is more close to one, suggesting that in the period of 1986 until 1999 included, Vieira da Silva paintings' prices seem to be better predicted in euros. On the other hand, the $\theta post99$ coefficient of 0.310 suggests the opposite for the second period of 2000 to 2014. In order to be sure about the best predictor in model (2), the two coefficients were tested to check if they are equal. The test result was $p - value = 0.7296$. Once again, it fails to reject the null hypothesis of $\theta pre99$ coefficient being equal to $\theta post99$ coefficient, meaning that there is no difference between the coefficients as their values initially suggested. Overall, any of these two variables is not statistically significant, so any further concluding remarks cannot be made around this issue. Consequently, it is not possible to say that Vieira da Silva's works of art are better explained in euros rather than in dollars, or vice-versa.

VIII. Conclusion

In this study, there were three major aspects to be analysed regarding Vieira da Silva's artistic career as a painter, using data from auction prices since 1986 until 2014. In order to do this, several regressions based on hedonic prices estimation were calculated to shape the relationship between age and creativity, to understand the time value of Vieira da Silva's time valuation and finally, to check if there was an internationalization phenomenon in her career.

Firstly, Vieira da Silva seems to peak quite early in her career, around the age of 36, meaning it fits Galenson's description of a conceptual artist. Secondly, Vieira da Silva

seems to be insensible to Portuguese economic cycles, with the exception of financial crises in 2008, which has a smoothly negative impact on Vieira da Silva's estimated index, which might be an indicator for a stable investment for minor economic downturn periods. On the other hand, her index seems to follow the same fluctuations of Portuguese market index for art paintings, although with more breaks between continuously uprising periods. Thirdly, the internationalization phenomenon seems to remain undisclosed, once estimation results show no evidence of her paintings' prices being be better explained by euros rather than US dollars, or vice-versa.

Moreover, the estimated models based on auction sales data do not fully capture the artist productivity, once it does not take into account the total volume of Vieira da Silva's artistic work, leaving behind some of the work that was not involved in auctions at all.

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Appendix

Table 3: Annual Estimated Prices for Vieira da Silva's career

Year	Age	Price	Paintings	Year	Age	Price	Paintings
1931	23	172,22	1	1961	53	935,09	8
1932	24	263,97	0	1962	54	905,54	8
1933	25	384,03	0	1963	55	881,84	1
1934	26	532,23	0	1964	56	863,64	5
1935	27	705,17	0	1965	57	850,56	9
1936	28	896,28	0	1966	58	842,27	6
1937	29	1 096,41	0	1967	59	838,36	5
1938	30	1 294,10	0	1968	60	838,46	7
1939	31	1 481,35	5	1969	61	842,11	8
1940	32	1 645,95	0	1970	62	848,81	6
1941	33	1 781,45	0	1971	63	857,99	3
1942	34	1 883,21	1	1972	64	868,95	4
1943	35	1 949,47	1	1973	65	880,87	7
1944	36	1 981,06	0	1974	66	892,80	7
1945	37	1 980,87	0	1975	67	903,59	7
1946	38	1 953,26	0	1976	68	911,97	7
1947	39	1 903,38	3	1977	69	916,51	2
1948	40	1 836,59	7	1978	70	915,68	3
1949	41	1 758,05	9	1979	71	907,93	6
1950	42	1 672,40	11	1980	72	891,80	5
1951	43	1 583,60	11	1981	73	866,04	4
1952	44	1 494,87	9	1982	74	829,78	4
1953	45	1 408,69	11	1983	75	782,67	1
1954	46	1 326,88	15	1984	76	725,09	0
1955	47	1 250,70	13	1985	77	658,16	0
1956	48	1 180,93	14	1986	78	583,85	3
1957	49	1 118,00	11	1987	79	504,81	0
1958	50	1 062,06	13	1988	80	424,23	0
1959	51	1 013,06	4	1989	81	345,50	1
1960	52	970,83	9	1990	82	271,87	1

Table 4: Summary and Descriptive Statistics for Vieira da Silva Oil in Canvas sample

Number of paintings sold in auctions	219
Median age of paintings executed	49
Median year of paintings executed	1960
Most number of paintings executed in one year	14
Average paintings per year	3.7
Age in year with more paintings executed	46
Average age of paintings execution	51.6
Years with more paintings sold	2006, 2011 and 2013
Maximum price in US dollars	$ 1 844 748.00
Minimum price in US dollars	$ 502.00
Average paintings' price in US dollars	$ 188 569.53
Median price in US dollars	$ 118 395.00

Figure 3: Vieira da Silva's age-valuation profile for Oil in Canvas sample

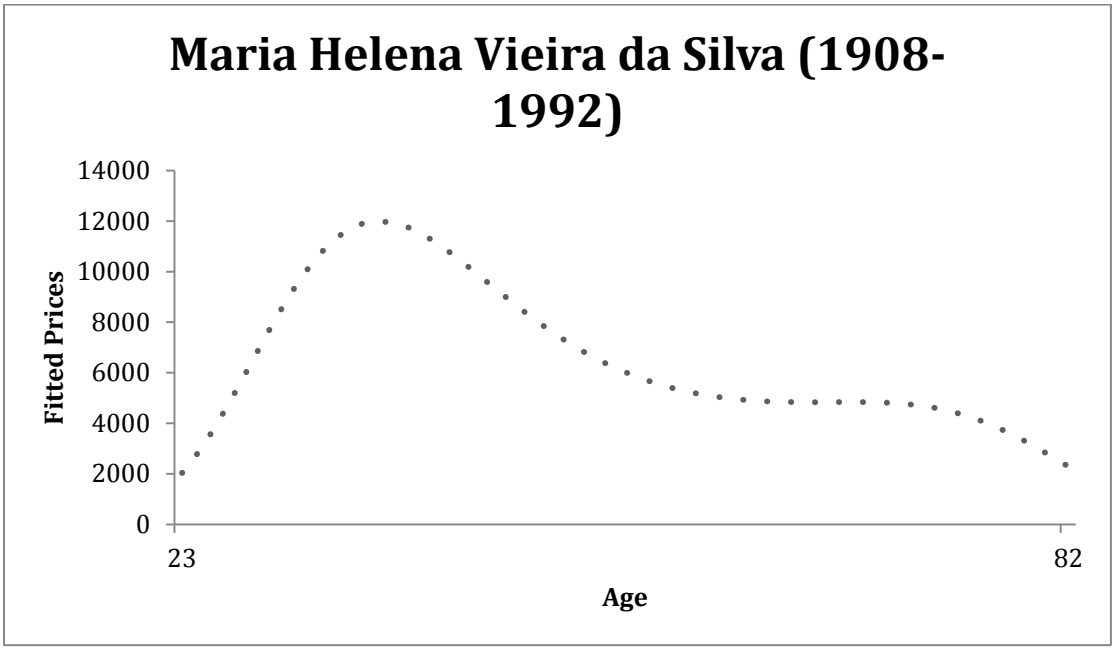

Figure 4 – Vieira da Silva Index, Vieira da Silva Index for Oil in Canvas sample

(base year 2000)