

George Viau's collection: a computational approach

Léa Saint-Raymond¹, Henrik Abgaryan², Alexios Lazaros Georgiou², Juliette Montanteme³, Jade Nijman⁴, Fabriccio Miguel Novelli Duro⁵, and Omer Faruk Yildiran¹

¹ENS-PSL

²Université Paris Dauphine – PSL

³Mines Paris-PSL

⁴EHESS / Institut Jean Nicod

⁵UNICAMP / INHA

Abstract

This paper analyzes the collection of George Viau (1855-1939) from a computational perspective. Indeed, this dental surgeon, close to the Impressionists, collected several hundred works of art in the first half of the 20th century: the auctions of his collection, in 1907, 1930 and after his death, in 1942, 1943 and 1948, accounted for 642 artworks and, during the Occupation, the 1942 sale produced a total of more than 46 million francs. Thanks to statistics, econometrics, network analysis and cartography, it is possible to understand the salient features of the collection and its place in the world of Parisian auctions.

On December 11, 1942, one of the most important auctions sales during the Occupation opened in Paris, offering buyers "an ensemble that alone represents more than many public galleries could ever assemble".¹ This sale dispersed a large part - without it being possible to quantify it - of George Viau's collection and produced an exceptional total of 46,796,000 francs. This major collector of the first half of the 20th century had died three years earlier, in 1939. Born in Nancy on March 29, 1855, George Viau had followed in the footsteps of his father, who had become one of the family dentists of Tsar Alexander III. After studying dentistry, George Viau founded the *École Dentaire de Paris* in May 1880 and the following year, he was appointed professor of prosthetics. At the turn of the 20th century, he opened a large dental practice of more than 400 square meters at 109, boulevard Malesherbes, and built up a large clientele (Fig 1). During the 1900 World's Fair, Viau was made *chevalier* of the Legion of Honor and from then on, he made numerous trips to London and the United States for lectures and demonstrations.²

George Viau also showed a strong taste for the arts, whether painting or music. In his Parisian apartment at 47, boulevard Haussmann, and in his property at Villennes-sur-Seine, he received painter friends such as Pissarro, Monet, Renoir or Sisley, from whom he bought paintings directly. Between the beginning of the 20th century and his death in 1939, he built up a collection of several hundred works of art, the evolution of which was complex. This paper aims to analyze George Viau's collection quantitatively and diachronically, and to understand the secondary art market of his auction sales, during his lifetime and after his death.

After explaining the dataset (section 1), this paper will thus focus on the artists of the Viau collection (section 2), then on the artworks (section 3) and, finally, on the auction sales that have dispersed this set (section 4).

¹Pierre Imbourg, "La vente de la collection George Viau et son total de 46.796.000 francs", *Beaux-Arts*, December 20, 1942, quoted by Lecordier[4], p.32

²See his biography in Theuveny and Petit-Castelli[12], p. 6-7.



Figure 1: Edouard Vuillard (1868-1940), *Le Docteur George Viau dans son cabinet dentaire*, 1914, oil on canvas, 107.7 x 137.5 cm, Paris, musée d'Orsay, RF 1977 396, wikicommons

1 Dataset of George Viau's collection

1.1 An iceberg with blurred contours

George Viau bought works from artists, dealers - private sales in their galleries - and directly at public auction. Unfortunately, no account book has been preserved, which would have allowed us to reconstruct the complete history of his acquisitions. To complicate this study, George Viau regularly sold works from his collection at private sales - the most important of which took place between 1916 and 1918, when he sold dozens of works to the Danish collector Wilhelm Hansen.³ The documents of these private sales, when they exist, are also difficult to access.

In March 1907, George Viau organized a first public sale in Paris, auctioning 171 paintings and 104 works on paper. The event, spectacular in the art world, was hailed by the press[12]. Viau repeated the experience and organized an auction sale for (part of) his collection in 1930. After his death in 1939, his heirs sold a large part of his collection at auction, at posthumous sales in 1942, 1943 and 1948.

Apart from these public sales, no document draws the chronology of Viau's private purchases and private sales. It is thus very difficult to identify the contours of his collection - in blue on the diagram (Fig 2) - whereas it is possible to conduct spot surveys by studying the auction sales - in yellow on the same figure. Indeed, because of their public nature, these events make it possible to analyze part of Viau's collection - that which Viau decided to sell at auction or, after his death, that which his heirs disposed of at his posthumous sales.⁴ As a matter of fact, the minutes of most of the Parisian auction sales are kept in the *Archives de Paris*[9], and so are the minutes of Viau's 1907, 1930, 1942 and 1948 auction sales.⁵

³The private purchases of Wilhelm Hansen, from Viau, were made visible through the exhibition catalog of Hansen's collection in Charlottensborg, in 1918, which mentioned the pedigree "former Viau collection": *Fortegnelse over Malerier, Akvareller, Pasteller, Tegninger af Franske Kunstnere Udstillede Paa Charlottenborg, 1 Oktober 1918*, Copenhagen, V. Vinkel é Magnussen, 1918, available online: <https://www.kunstabib.dk/samlinger/udstillingskataloger/samlingen/000218102>

⁴Viau organized an auction sale of prints, in 1909, but this part of his collection is not in the scope of this paper, which focuses on Viau's paintings, drawings, pastels and sculptures.

⁵Archives de Paris, D48E3 90, D48E3 117 and D149E3 17.

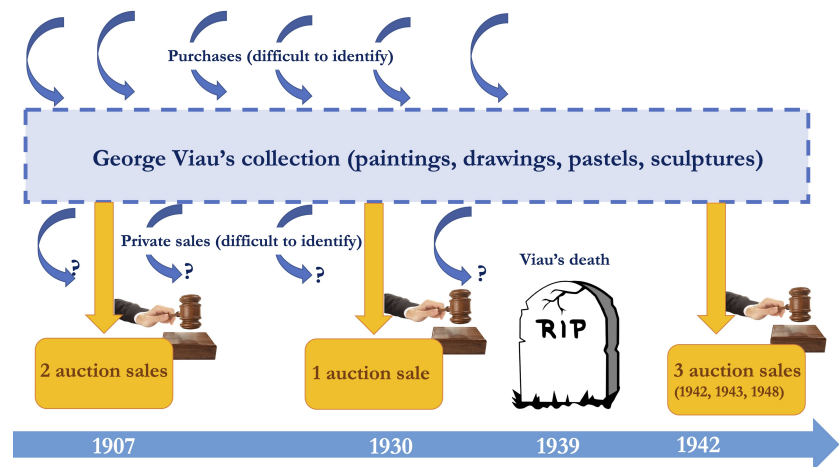


Figure 2: Representation of George Viau's collection, by Léa Saint-Raymond.

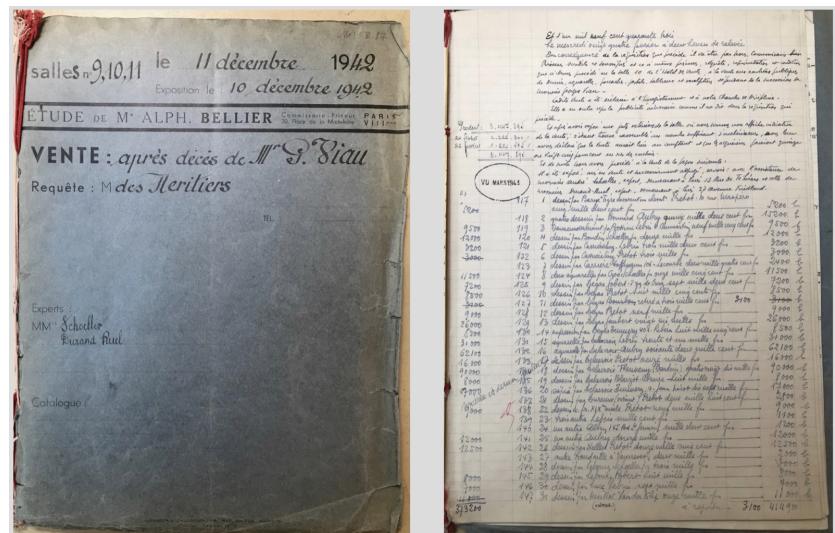


Figure 3: Minutes of the sale after the death of George Viau, 1942, Archives de Paris, D149E3 17.

1.2 The making of the dataset

The corpus of the Viau collection - reduced to the works he (or his heirs) put at auction - was built by Léa Saint-Raymond and a group of students who followed her course "From the corpus in humanities to the digital project", at the ENS-PSL, between September 2021 and June 2022.⁶ Jessie Abad, Anaïs Chazel, Marie Durif-Varambon, Rémi Emorine, Alix Enée, Darlène Kuyu, Maximilien Lecordier and Léa Monteil thus worked on the making of this corpus.

The first step was to gather the works collected by George Viau. To do so, the auction catalogs of the collection were collected at the BnF and the INHA Library, then entirely transcribed in a shared csv file, taking the form of a Google spreadsheet. Each work described in the catalog (Fig 4) corresponds to a line in the spreadsheet (Fig 5).

The information about the works corresponds to the following variables in the csv file: number of the artwork in the auction catalogue, section of the auction catalogue in which the artwork appears, first

⁶More information on this part of the "Digital Viau" project can be found online: <https://odhn.ens.psl.eu/en/newsroom/digital-viau-corpus-online>, accessed November 22, 2022.

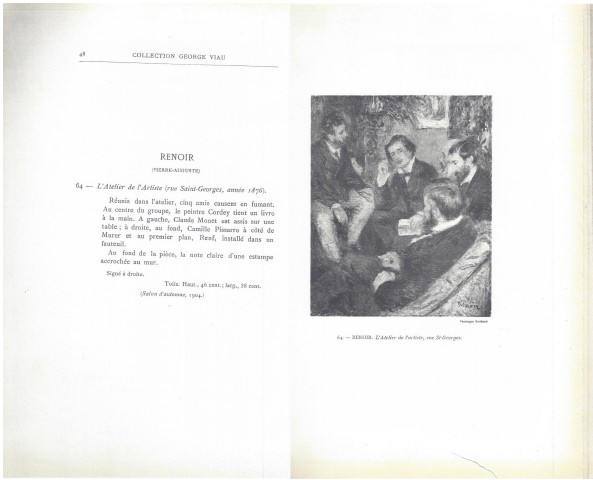


Figure 4: Extract of the auction catalogue of the 1907 Viau sale, pages 48 and 49.

id	no	year	month	number	section	name	at	first_name	artist	titre	year	cat	medium	inscriptions	h	l	description	pedigree	exhibitions	bibliography	reproduced	
61	1907	3	4	61	Tableaux	Renoir	Pierre-Auguste	Ingénue	Toile	Signé dans	53	46	En bonte, la tête légère: Salon d'automne, 1904. OCL									
62	1907	3	4	62	Tableaux	Renoir	Pierre-Auguste	Bords de la Méditerranée	Toile	Signé à gau	46	55	Se détachant en rose claire sur les rochers de premier plan d									
63	1907	3	4	63	Tableaux	Renoir	Pierre-Auguste	Jeune Femme	Toile	Signé dans	46	58	L'Artiste, d'une église: Salon d'automne, 1904. OCL									
64	1907	3	4	64	Tableaux	Renoir	Pierre-Auguste	L'Atelier de l'Artiste (vue Saint-Georges)	Toile	Signé à dro	46	58	Résumé dans l'atelier, en Salon d'automne, 1904. OCL									
65	1907	3	4	65	Tableaux	Renoir	Pierre-Auguste	La Quai Malakoff	Toile	Signé à dro	58	46	A gauche, en bonte: Salon d'automne, 1904. OCL									
66	1907	3	4	66	Tableaux	Renoir	Pierre-Auguste	Jeune Femme	Toile	Signé dans	53	25	Coffre d'un chapeau de Salon d'automne, 1904. OCL									
67	1907	3	4	67	Tableaux	Renoir	Pierre-Auguste	Jeune Femme	Toile	Signé dans	27	22	Elle est vue de trois quarts vers la gauche, coiffé OCL									
68	1907	3	4	68	Tableaux	Sisley	Alfred	Neuve morte	Toile	Signé à dro	80	100	Pas d'eau pe et d'un gen au plumage bariolé, s'OCL									
69	1907	3	4	69	Tableaux	Sisley	Alfred	Premiers jours d'automne, le s Toile	Signé à dro	66	92	A droite d'un chemin sinueux: longeant la forêt, des arbr										
70	1907	3	4	70	Tableaux	Sisley	Alfred	Apprenti du mill (1892)	Toile	Signé à dro	65	81	Sur le Lot, qui village l'exposition de la Libe OCL									
71	1907	3	4	71	Tableaux	Sisley	Alfred	L'Inondation	Toile	Signé à dro	54	73	Au premier Collection Vezet									
72	1907	3	4	72	Tableaux	Sisley	Alfred	L'Église de Boulogne à More Toile	Signé à dro	54	73	A gauche, le long de la rivière, le chemin de hal OCL										
73	1907	3	4	73	Tableaux	Sisley	Alfred	La Laiterie de Roux (1885)	Toile	Signé à dro	54	73	Un chemin longe les champs qui étendent vers la droite, su									
74	1907	3	4	74	Tableaux	Sisley	Alfred	La Seine à Port M 1875	Toile	Signé à gau	54	73	A gauche, au bord de l'Exposition Centennale, OCL									
75	1907	3	4	75	Tableaux	Sisley	Alfred	Tourant de Loue (1886)	Toile	Signé à dro	54	73	Tout à droite, au premier plan, incrusté un trou OCL									
76	1907	3	4	76	Tableaux	Sisley	Alfred	La Chemie de Venexa à Thon Toile	Signé à dro	50	65	Un tourant de la berge occupe tout le premier OCL										
77	1907	3	4	77	Tableaux	Sisley	Alfred	La Chemie des (1873)	Toile	Signé à dro	61	50	A droite, le ruisseau de vautre d'un moulin d'usine propre se									
78	1907	3	4	78	Tableaux	Sisley	Alfred	Un Chemie près du Parc de Cc Toile	Signé à dro	40	65	A gauche, le arbre du parc se présente tout omb OCL										
79	1907	3	4	79	Tableaux	Sisley	Alfred	L'Abreuvoir de M (1875)	Toile	Signé à gau	38	55	Decembre au premier plan, contourant l'arbre OCL									
80	1907	3	4	80	Peintures et Aquarelles	Pissarro	Adolphe-Jean	La Courvaissence	Peinté	Signé à dro	71	40	Une fillette Collection l'exposition Centennale OCL									
81	1907	3	4	81	Peintures et Aquarelles	Edgar	Edgar	La Famille Marie	Peinté	Signé à dro	90	50	A droite, une fillette, de l'exposition Centennale OCL									
82	1907	3	4	82	Peintures et Aquarelles	Edgar	Edgar	Danses au foyer	Peinté	Signé à gau	54	76	Sur la banquette de velours commode, au l'opé OCL									
83	1907	3	4	83	Peintures et Aquarelles	Edgar	Edgar	Danses au châte rouge	Peinté	Signé à dro	64	49	Elle est vue de dos, au moment d'entrer en scène OCL									
84	1907	3	4	84	Peintures et Aquarelles	Edgar	Edgar	La Toilette	Peinté	Signé dans	31	27	Se baignant vers la table de toilette au marbre au OCL									
85	1907	3	4	85	Peintures et Aquarelles	Johan-Barthold	Johan-Barthold	La Seine à Rouen (1857)	Aquarelle	Signé à dro	24,5	40	A gauche, Collection Desre									
86	1907	3	4	86	Peintures et Aquarelles	Johan-Barthold	Johan-Barthold	Moulins en Holla	1868 Aquarelle	Signé à dro	16	27	A droite, sur le sentier longeant un canal, un pêcheur à la lig									
87	1907	3	4	87	Peintures et Aquarelles	Edmond	Edmond	Port de Madan	1880 Peinté	Signé à dro	25	55	Représenté à m corps l'exposition Monet, Eco OCL									
88	1907	3	4	88	Peintures et Aquarelles	Bunthe	Bunthe	A la Campagne	Aquarelle	Signé à gau	20	26	Dans la prairie longeant le bois qui limite tout le fond du pa									
89	1907	3	4	89	Peintures et Aquarelles	Chaurmire	Chaurmire	Chaurmire à Aax	1879 Peinté	Signé à dro	60	73	Adossée au flanc d'une haute colline aux arbres OCL									

Figure 5: Screenshot of the csv file, before adding the authority names.

name and name of the artist (as they are written in the catalogue), title of the work, date of its creation (if mentioned in the catalogue), medium of the work, inscriptions (signature or mark), dimensions in cm, description of the work in the catalogue, pedigree (i.e. mention of the former collectors or auction sales in which the work appeared), former exhibitions in which the work was displayed, as mentioned in the auction catalogue, bibliography in which the work appeared, presence of a reproduction of the artwork in the auction catalogue.

To this information, as mentioned in the auction catalog, were added those of the - handwritten - minutes of the sale. They provide some useful insights on the name and sometimes the address of the winning bidder and on the hammer price, net of the buyers' fee, in current francs (Fig 3).

The final step was to work on this database, so that it could be visualized. In particular, authority names were added for the artists in the collection, thanks to general knowledge in art history and available repositories such as ULAN (The Getty Union List of Artists Names). When it was possible - especially, when the address was mentioned in the auction catalogue -, the purchasers were also identified, through the *Almanach Didot-Bottin du commerce* (a Parisian directory of names, occupations and addresses), the GeoMAP project[2] and Léa Saint-Raymond's PhD[9].

The making of the dataset led to a website, "Digital Viau", hosted by the ENS-PSL *Observatoire des humanités numériques*. It provides a digital library of George Viau's artworks, sorted by artists and by categories (paintings, drawings, sculptures), and it also gives access to former collectors and to purchasers at auction.

1.3 The computational approach

Once the "Digital Viau" website was launched, the dataset constituted the starting point of a more computational analysis, led by another team of graduate and PhD students, under Léa Saint-Raymond's supervision. From November 21 to November 25, 2022, they trained in computational sciences during a "PSL Intensive Week", i.e. an intensive course with projects in the afternoon, hosted by PSL University. The six students who worked on Viau's collection had various backgrounds, from art history to computer science:

- Henrik Abgaryan is a computer scientist from the American University of Armenia, currently studying in the "Artificial Intelligence, Systems and Data" Master at PSL Dauphine.
- Alexios Lazaros Georgiou is a graduate Computer Scientist from Greece (AUEB), currently studying in the "Artificial Intelligence, Systems and Data" Master at PSL Dauphine.
- Omer Faruk Yildiran is a graduate student of Cognitive Science at ENS-PSL.
- Jade Nijman is a first year PhD in Arts and Litteratures (EHESS), working at the Institut Jean Nicod (ENS-PSL) under the direction of Roberto Casati. She is actually working on the metacognitive feeling of disorientation in arts, in the Disorientation team of the IJN.
- Fabriccio Miguel Novelli Duro is a Brazilian art historian. He is a PhD candidate in Art History (UNICAMP) and develops a research internship at the Institut national d'histoire de l'art with a grant by FAPESP (Grant number 2021/15198-7).
- Juliette Montantème is a last year engineering student at Mines Paris - PSL.

This team worked during four full days on the dataset, in order to visualize the broad outlines of George Viau's collection. Such a quantitative approach is necessary because of the volume of artworks offered for sale: in 1907, George Viau put 273 works at auction, 104 in 1930, and his heirs offered 278 works for sale in 1942, 1943 and 1948. By identifying the duplicates and removing them, 642 unique artworks were put at auction: a computational analysis is thus justified. Throughout this paper, the chronology of the collection is marked by three main moments: the early period (the 1907 sale), the period of "old age" (the 1930 auction sale, when George Viau was 75 years old) and the period after George Viau's death (1942, 1943 and 1948 sales).

2 A rather stable collection of "big French names"

Working on artists is a first entry point in the analysis of George Viau's collection. In the previous step - the constitution of the dataset - the authority names of the artists were added to the "verbatim" ones. Indeed, different "verbatim" entries in the auction catalogs - such as "Monet (Cl.)", "Monet" and "Monet (Claude)" - have been grouped into a single artist name, identified as an authority name: "Monet, Claude".

This preliminary work served as a starting point for a second enrichment. From these artists' authority names, the students mobilized the free software Openrefine to add biographical data (gender, date and place of birth and death, nationality), thanks to the API of Wikidata[1]. This section details the main lines of force of the Viau collection, seen through the prism of the artists.

2.1 French patriotism

This very simple graph (Fig 6) displays the most important artists (in volume of artworks sold at auction). The three chronological periods are represented by a blue gradient.

The most present artist in Viau's collection - at least, the one that was most offered for sale - is Edgar Degas, with 57 artworks - the majority of which (52 works) were sold during the after death

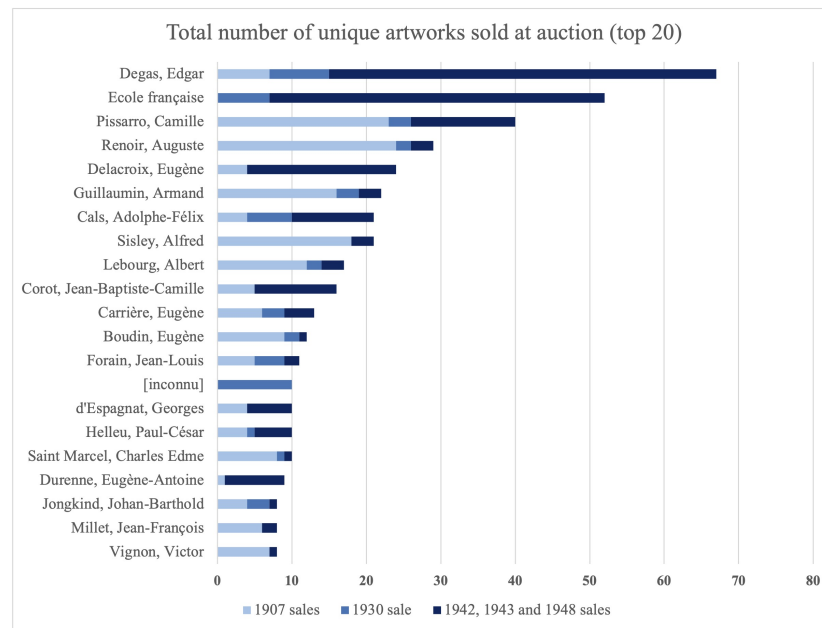


Figure 6: Top 20 artists in the Viau sales. Visualization : Alexios Lazaros Georgiou and Léa Saint-Raymond

sales. The auction catalogue mentions that these artworks were mainly bought during Degas's Parisian auction sales, in 1919, after the artist's death. Then come anonymous works labelled as *École française* ("French school"), with 52 works, mainly sold in the after death sales. George Viau had constantly some artworks by Adolphe-Félix Cals, Eugène Carrière or Jean-Louis Forain. An important feature is the importance of the impressionists - Camille Pissarro, Pierre-Auguste Renoir, Alfred Sisley, Armand Guillaumin, Albert Lebourg - and the "friends of the impressionists" such as Eugène Boudin and Paul-César Helleu. However, the impressionists' artworks were more frequent at the 1907 sale than in the 1930 and in the 1940s ones.

George Viau's collection also included many isolated artists. Out of a total of 145 different artists, 85 were represented by only one work (for example, Gustave Caillebotte, Aristide Maillol, Albert Marquet or Odilon Redon), which was more than half of the artists. Only 21 artists (Fig 6) had 8 or more works in the Viau collection put at auction.

It is therefore necessary to take a quantitative view. The following map and its zoom (Fig 7) display the places of birth and death of all the artists from George Viau's collection. Most of them were born in France and died in Paris.

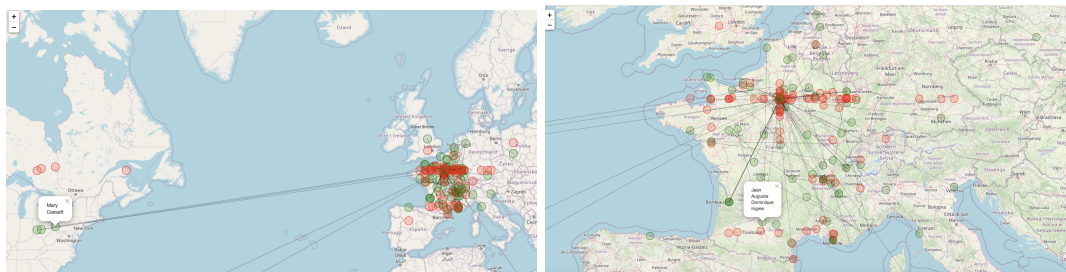


Figure 7: Places of birth (in green) and places of death (in red) of the artists from the Viau collection. Screenshot (and zoom) of an html map made with Python by Alexios Lazaros Georgiou

The graph displaying nationality (Figure 8) sums up this "patriotic" aspect even more strikingly, since 527 artworks from the auctioned Viau collection were created by a French artist, i.e. 83% (if we remove the 10 works created by an "unknown" artist). The British nationality comes in second with 22 works - 21 were by the impressionist Alfred Sisley, who resided in France, and one by the British painter and lithographer Richard Parkes Bonington. George Viau's tropism for "French" works

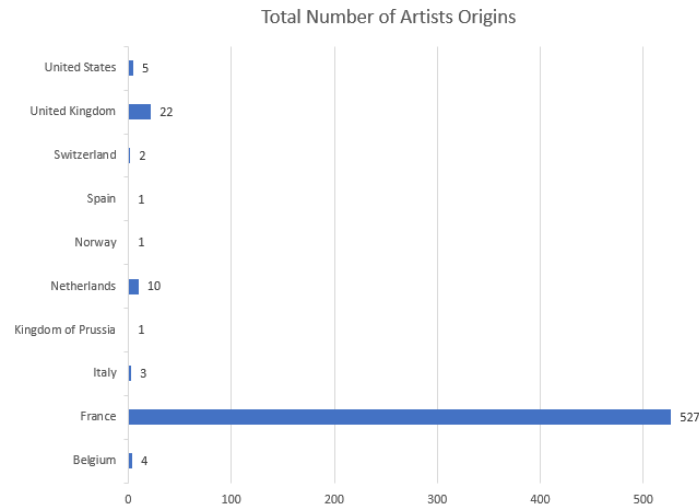


Figure 8: Number of artworks from the Viau collection, sold at auction and sorted by the artist's nationality, by Omer F. Yildiran

was not an exception: in the first half of the twentieth century, at the time the dentist assembled his works, the core of "good" contemporary art collections sold at Parisian auctions gathered artworks by French artists (mainly from the 1830 School and the Impressionists)[9]. By homology, the majority of contemporary artists sold at auction in Paris at the same time - living or recently deceased - were of French nationality[7].

2.2 A man's world

Beyond the overrepresentation of French artists, another characteristic of George Viau's collection is the near absence of women artists (Fig 9). Indeed, Viau's auctions showcase the massive presence of artworks by male artists (568) and very few works by women (only 10 artworks). The latter were the impressionnists Mary Cassatt (4 works) and Berthe Morisot (3 works), but also Louise Breslau, Jeanne Forain and Louise-Joséphine Sarazin de Belmont (1 work each). Not only was Viau's collection highly masculinized, but this male overrepresentation became more pronounced over time (Fig 9): of the 10 works represented by women, 7 were sold in 1907.

Again, this characteristic was not unique to George Viau's collection since the overwhelming majority of contemporary artworks offered for sale in Paris at the same time were by men[9]. However, the presence of female figures is noticed as the object of the "male gaze", specially in the category of pastels, as the naked scenes are ranked in forth as it comes to the iconography (Fig 10), as we will notice in section 3). Finally, Viau's collection could be characterized as produced by French and male artists.

2.3 Big (old) names rather than younger artists

This subsection analyzes a last feature, regarding the artists in Viau's collection: the age variable, which was added through Openrefine and the Wikidata API. As the collection contains many pieces, it could be interesting to define generations of artists of the collection and classify the artworks depending

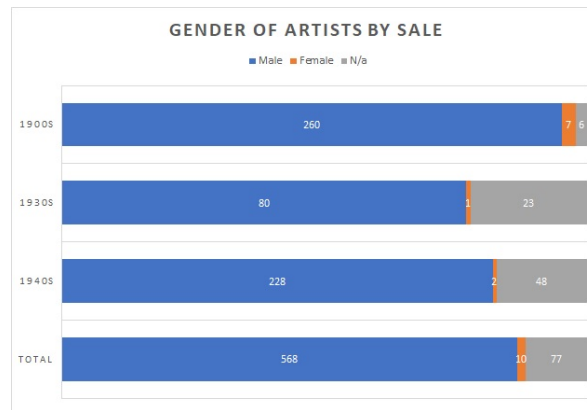


Figure 9: Gender of the artists by Viau's sale, generated by Fabriccio M. Novelli Duro

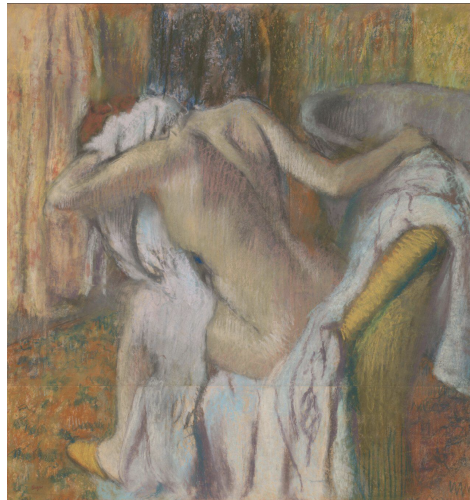


Figure 10: Edgar Degas (1834-1917), *Après le bain. Femme s'essuyant*, pastel, 105 x 99 cm, London, The National Gallery, NG6295. N°74 of the Viau sale of December 11, 1942, sold for 2,230,000 current francs (excluding buyer's fee) to Mr Bellier for Mrs. Louis Viau

on these generations. A first approach thus consisted in building boxplots showing the spread of birth years of all artist for each auction. These boxplots are quite similar for the three periods (1907, 1930 and the after death sales), and the median birth year oscillates between 1840 and 1845, which is close to 1855, i.e. George Viau's birth year. It is possible to assume that George Viau mainly collected pieces from his contemporaries.

To evaluate more precisely the generations of the artists, a conventional value has been created in the dataset to determine the temporal distance of an artist to the year of the auction. If the artist was alive at the time of the auction, then the value is positive and corresponds to the age of artist. If the artist was dead, then the value is negative and corresponds to the years since the death of the artist. This way, it is possible to estimate the distribution of generations of artists sold during the 3 auctions (Fig 11).

For the first auction, in 1907, the histogram highlights that Viau mainly sold artworks from confirmed, and quite old (or dead) artists. This observation could have had an impact on the hammer price of the artworks during the auction. Again, George Viau's collection was not an exception : at the same period, a "good" collection of "modern" artworks included the painters of the 1830 school (the

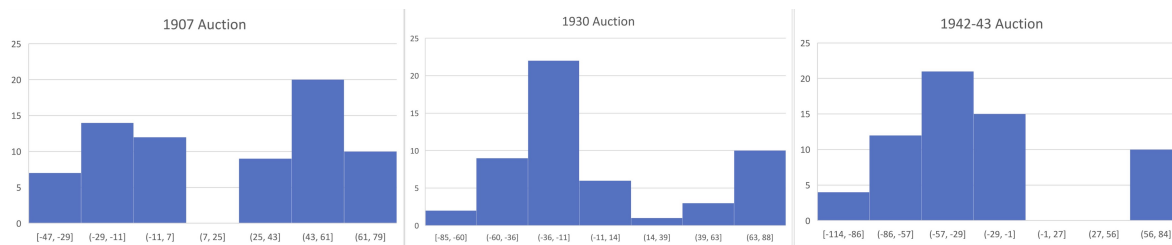


Figure 11: Evolution of the distribution of generations of artists sold during the auctions, by Juliette Montaneme and Jade Nijman.

Barbizon painters and the Orientalists) and added to this base the "safe havens" constituted by the impressionist artworks[9]. Viau can thus be compared to another major collector of the beginning of the 20th century - Alexandre Berthier, prince of Wagram[11] - who had quickly stopped buying works of the 1830 School in favor of the Impressionists.

For the second auction in 1930, it seems that the same generational pattern occurs, but with a shift of 23 years. This might be linked to the fact that Viau only sold (and to a certain extent, collected) pieces from old, confirmed artists. Viau did not seem to have renewed its collection, because there are very little artworks from young artists. For the last auctions, these shift in generations reached a peak: only a few artists were still alive, and they were all old - obviously at this time, Viau was already dead, so the collection could not have evolved a lot since 1930.

3 In Viau's eyes: the taste of a collector

After the study of the artists, that of the works themselves allows for a quantitative understanding of George Viau's collection. It should be noted that this paper does not address Viau's engraved works, which were sold at auction in Paris on December 6 and 7, 1909[12]. Similarly, his art objects will not be studied. It is known, in fact, that George Viau also collected Chinese objects and books: in the 1925 directory of collectors[10], he self-declared his "paintings of the 1830s School and Impressionists, objects of art (archaic China), books".⁷ After his death, his engravings and his Chinese artefacts were sold at auction, in Paris, on February 26, 1943[12]. This article thus focuses on Viau's paintings, graphic arts and sculptures, based on the auction sales he - or his heirs - made.

3.1 A clear preference for two-dimensions artworks

The main difficulty that appears in the analysis is the absence of images for the vast majority of the artworks. Indeed, only 81 pieces out of 273 were reproduced in the 1907 auction catalog, 18 out of 104 in that of 1930, and 70 out of the 278 works after death, that is to say respectively 30%, 17% and 25% of the items. To analyze, as a whole, both the works that can be seen - in black and white - and those who are not reproduced in the catalogs, it becomes necessary to work on the common variables to all artworks: the medium and the title.

The first variable of interest - the medium - was divided into four broad categories:

- painting ("peinture"): oil on canvas, oil on panel, painting on cardboard, on metal, canvas or paper mounted on cardboard.
- graphic arts ("arts graphiques") : watercolor, pencil, pen sketch, drawing, charcoal, gouache, wash, graphite, sanguine, sepia.

⁷"Tableaux de l'Ecole 1830 et impresionistes, objets d'art (Chine archaïque), livres", in *Annuaire de la curiosité, des beaux-arts et de la bibliophilie*, Francis Campbell fondateur, Paris, [unspecified publisher], 1925, p. 110.

- pastel ("pastel")⁸
- sculptures ("sculpture"): bronzes, plaster, marble, glass paste.

As with most collectors of early 20th century art[9, 10], George Viau focused on paintings (Fig 12), with a percentage rising to 60% of the auctioned works. Then come the graphic arts and the pastels, representing more than a third of the collection. Only 14 sculptures were offered for sale, mainly after his death. Viau's collection was therefore mainly devoted to two-dimensional works, which totally dominated sculpture - this phenomenon, which was already present in the 19th century[9, 10], also crosses time and characterizes the contemporary art collections for the 2000s[5].

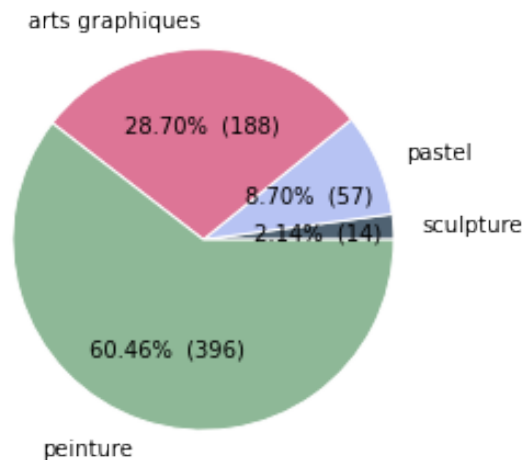


Figure 12: Percentage of different categories of art forms in the auction sales. Graph generated by Henrik Abgaryan

3.2 Viau's taste through the titles

The analysis of the works, reproduced or unseen, can be done through the analysis of their titles. An empirical and inductive approach was first favored, in order to identify the major iconographic categories that made up George Viau's collection. To do so, we used the Treecloud application developed by Philippe Gambette and his team[3]. From all the titles of the works sold at auction (from 1907 through 1948), a graph was thus generated (Fig 13) where the most frequent words are arranged on a tree which reflects their semantic proximity inside the text. In other words, the treecloud graph represents the frequency of the words in all the titles ; when a word is in red or orange, it means that it is a recurrent word, which is quite often associated with the ones in blue and so on. Navy blue ones are less frequent one. The following treecloud map thus models syntagmatic relationships. For instance (Fig 13), the word "Jeune" is frequently used and associated with the words "Fille", "Lisant" (young girl reading). It is also closed from the word "Baigneuse", but it is not necessarily present in the same title but in titles quite similar.

This treecloud graph allowed visualizing some iconographic groups of the collected artworks, through the titles. A first group, at the bottom of the graph, gathers words such as "landscape", "Seine", "surroundings", "bridge", "port" ("paysage", "Seine", "environs", "pont", "port"), and toponyms such as Honfleur, Pontoise, Chevreuse, Seine: it is thus possible to create, empirically, a first category of artworks collected by Viau, defined as landscapes. A little higher up, a branch gathers words such as

⁸This category was separated from "graphic arts" in order to avoid biases in the econometric analysis. Indeed, Degas' pastels were distinguished in a dedicated section of the 1942 auction catalog, achieving the highest hammer prices.

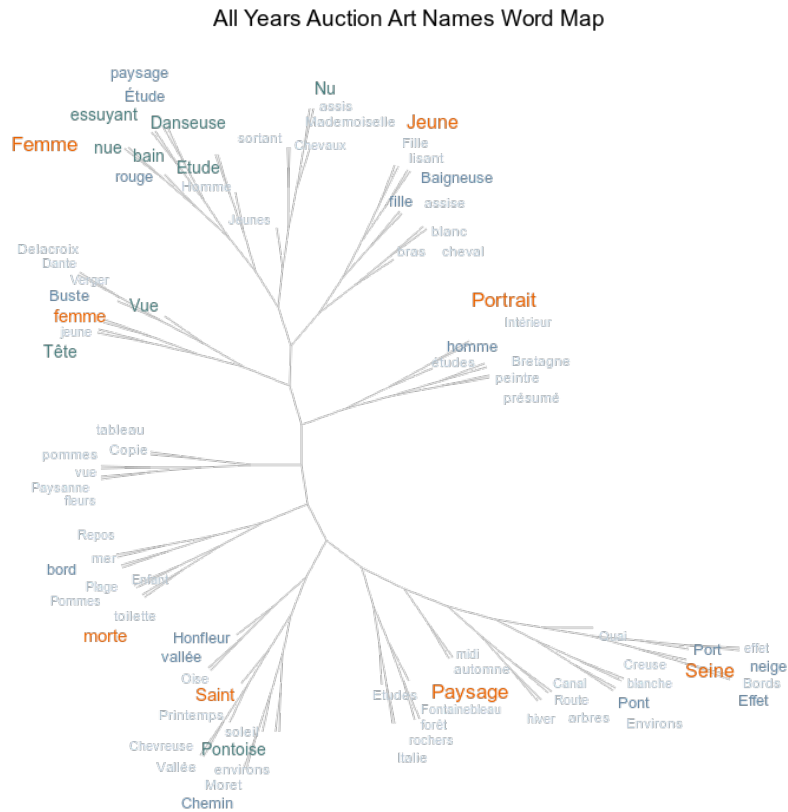


Figure 13: Treecloud of Viau's collection for all the auction sales. Visualization by Omer F. Yildiran and Fabriccio M. Novelli Duro

"morte" (from "nature morte") and "pommes": a category of still life can thus be created. At the top of the treecloud, the branches are more complex. The lexical field corresponds to works representing the human body or figure ("woman", "man", "nude", "girl", "head"), in sculpture ("bust") or in two dimensions. It would therefore have been possible to group his works under the category of the portrait or human figure. However, the interest of the Treecloud is to show a more complex categorization: a group stands out in two branches, at the top of the tree, representing titles evoking nude figures ("nu", "nue", "bain", "baigneuse"). Thanks to this graph, two groups are thus distinguished: the portraits, on the one hand, and the representations of naked bodies, on the other hand.

These broad empirical categories allowed synthesizing most of the works in the Viau collection that were auctioned. The remaining works, which are in the minority and therefore not represented in the Treecloud, have been grouped intuitively and pragmatically: animal scenes, historical scenes, religious scenes, copies ("copie" or "d'après") and genre scenes. This empirical method of categorization resulted in nine types of iconography, for the works in the Viau collection: animal, copy, history, still life, nude, landscapes, portrait, religious, and genre scene.

From the whole artworks sold at auction, the most significant artistic genres were landscapes (237 works), genre scenes (152), portraits (111) and nudes (62). To continue the analysis of the Viau collection, these iconographies can be crossed with the medium of the works (their "category"). Indeed, the iconography can vary a lot with the category. The histogram of figure 14 represents the share

(in percentage) of each iconography for every category. Each category has, indeed, its "preferred" iconography : genre scene for graphic arts, nude for pastels, landscapes for paintings and portrait for sculpture. For some categories, it appears that some iconographies are missing. In particular, for sculpture, the landscape iconography is missing (which seems quite obvious). On the other hand, the still life iconography only exists in the paintings of the Viau collection.

All these correlations may not represent the taste of George Viau specifically, but they can be also linked to the trend of the artistic period and the technical constraints of each category.

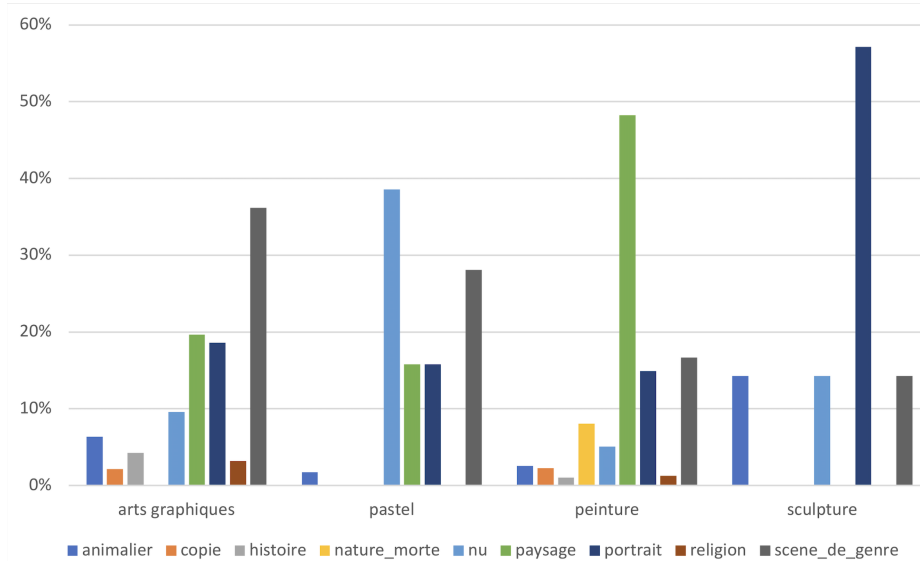


Figure 14: Distribution of the iconography depending on the category (in percentage of the category's collection). Visualization made by Juliette Montanteme and Jade Nijman.

3.3 Artists and iconography: clustering

This last sub-section makes the analysis of the works a little more complex, by crossing the iconography with the names of the artists in the Viau collection. To visualize such a large set of variables, in n dimensions, it is possible to use the methodology of principal component analysis. This graph (Fig 15) is a statistical and geometric projection that links the iconography of the artworks (sold at auction from 1907 through 1948) with their category and the name of the artists who created them. In order to avoid biases, the dataset was reduced to the artists for which George Viau had three works or more. The reading of this visualization is quite simple: the closer two points are, the more they are correlated, and the greater the distance between these points, the less these variables are correlated. The axes represent the main lines of force that distinguish the data, i.e. the main cleavages; at the intersection of the axes are the "average", common and non-discriminating variables. The principal component analysis was made with R software, by using this code:

```
1 install.packages(c("FactoMineR", "factoextra"))
2 library(FactoMineR)
3 library(factoextra)
4
5 # import dataset "acmviau"=> From Text => select the csv => in the "Row names" part,
   select "Use first column"
6
7 resultviau <- CA (acmviau, graph = FALSE)
8 fviz_ca_biplot (resultviau, repel = TRUE)
```

[illegible]

4 Viau's collection in the Parisian auction market

4.1 Record prices

13

were computed on the same basis, in constant 1907 francs - the date of first Viau sale - using a price index.⁹

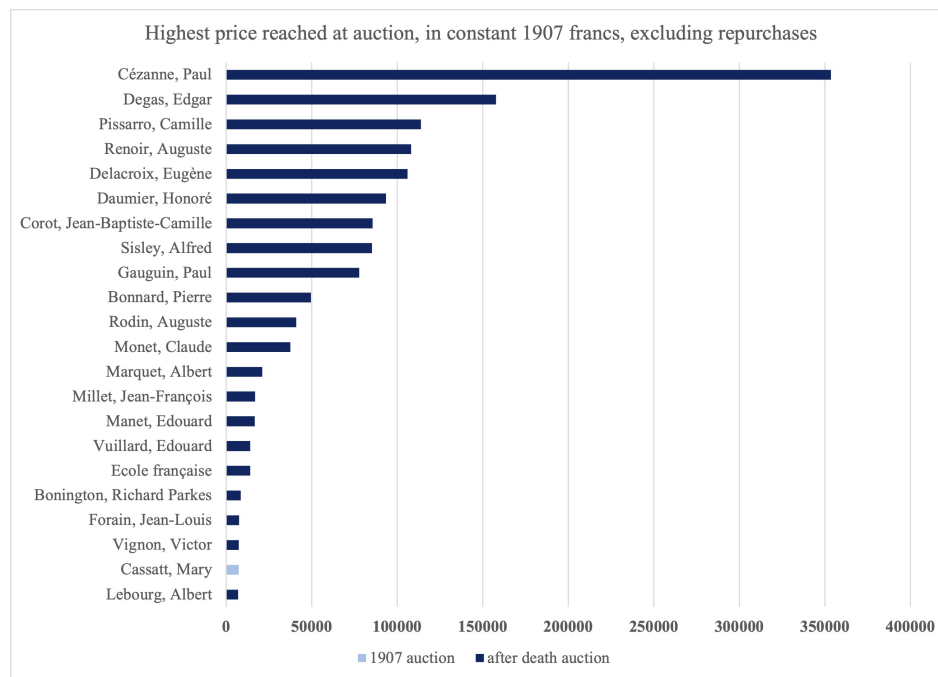


Figure 16: Top artists of the Viau collection, sorted by the highest prices at auction, in constant 1907 francs. Visualization : Alexios Lazaros Georgiou and Léa Saint-Raymond



Figure 17: Top records of the December 11, 1942, auction sale, excluding repurchases.

On the left : Paul Cézanne (?) (1839-1900), *La vallée de l'Arc et la montagne Sainte-Victoire*, c. 1887, oil on canvas, 55 x 45 cm, Paris, Orsay museum, MNR 528. Sold to Schoeller for Dr Gurlitt 5,000,000 current francs (excluding buyer's fee)

On the right: Camille Pissarro (1830-1903), *La route du Cœur-Volant, à Louveciennes*, 1871, oil on canvas, 33 x 41 cm, private collection. Sold to Schoeller for Dr Gurlitt 1,610,000 current francs (excluding buyer's fee)

⁹Thomas Piketty, *Les Hauts revenus en France au 20e siècle : inégalités et redistribution, 1901-1998*, Paris, Grasset, 2001, p.690.

The figure 16 lists the artists according to the artwork that reached the highest hammer price (in constant 1907 francs) in a Viau sale between 1907 and 1943. Not surprisingly[9], Cézanne comes first - for instance, he was the most expensive artist at Parisian auction in 1925[7]-, with a landscape of the emblematic Montagne Sainte-Victoire (Fig 17). Then came Edgar Degas, whose *Nude* (Fig 10) was purchased in 1942 by Mrs. Louis Viau, i.e. George Viau's daughter-in-law. The impressionists made up the bulk of the top artists (Pissarro - (Fig 17), Renoir, Sisley, Monet, Cassatt), along with the 1830 school painters (Delacroix, Corot), and other big names, like Paul Gauguin or Pierre Bonnard.

These performances must be qualified by the chronology of the auctions. Indeed, almost all of the principal artists in the Viau collection underwent a considerable increase in price between the first Viau sale in 1907 and its sale after his death between 1942 and 1943, regardless of inflation (Fig 18). The most dramatic increase was for Jean-Baptiste Camille Corot, which, in the Viau collection, saw its record price rise by 2500%. Only Gustave Colin, Auguste Lauzet and Eugène Carrière, whose works were sold in both 1907 and 1942-43, saw a decrease in their hammer price.

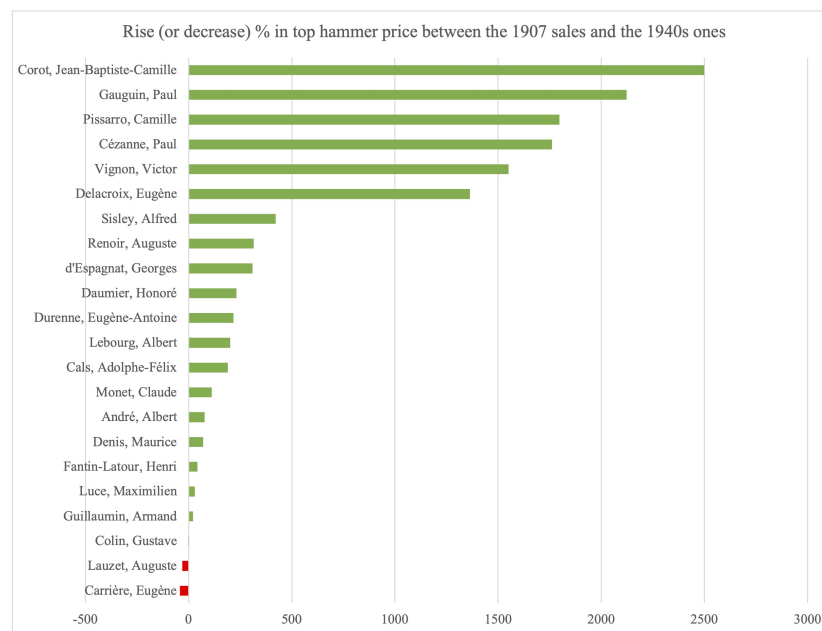


Figure 18: Rise in record prices, between 1907 and 1942-1943, in percentage of the 1907 record price and in constant 1907 francs. Visualization : Alexios Lazaros Georgiou and Léa Saint-Raymond

Similarly, regardless of the category of works or their iconography (except for historical scenes), average hammer prices were significantly higher in the posthumous sales of 1942-1943 than during the 1907 sale and, even more so, the 1930 sale (Fig 19). Pastels - by Degas - in particular saw their price soar in 1942.

These figures confirm the totally "exceptional[6]" aspect of the first sale after George Viau's death in December 1942, which reached the total product of 46,796,000 francs¹⁰, a sum that would equate to 9,189,484 euros nowadays¹¹. The historian Emmanuelle Polack[6] explains the success of this auction sale by the Viau collection itself, which offered a panorama of French art, and was patiently assembled by an amateur with very sure taste, linked with some of the great Impressionists, friend of Degas and Vuillard. On the other hand, this 1942 sale generated exceptional publicity, both in France and in Germany: its prestige was redoubled by the presence of German officers and representatives of the Louvre Museum.

¹⁰Minute of the auction sale, Archives de Paris, D149E3 17.

¹¹Historical currency converter, historicalstatistics.org

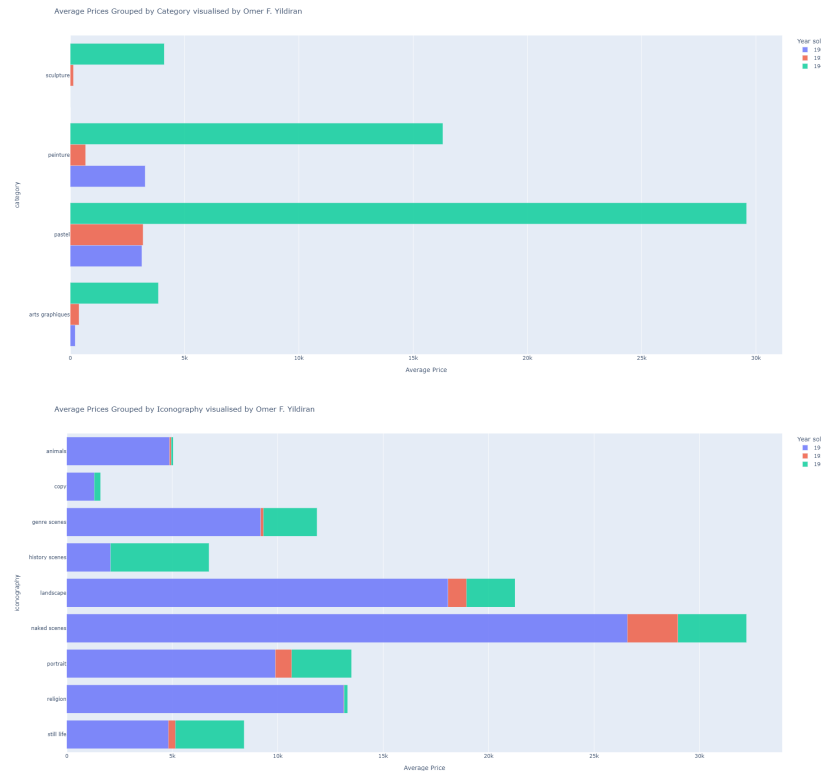


Figure 19: Average prices in constant 1907 francs grouped by category (above) and by iconography (below), visualised by Omer F. Yildiran

4.2 Econometric analysis

Price analysis can be refined using more advanced computational techniques. Econometrics is the application of statistical methods to economic data in order to give empirical content to economic relationships. More precisely, it is "the quantitative analysis of actual economic phenomena based on the concurrent development of theory and observation, related by appropriate methods of inference". An introductory economics textbook describes econometrics as allowing economists "to sift through mountains of data to extract simple relationships". A correlation matrix (Fig 20) was first computed, in order to visualize the whole dataset. It has been created using the following libraries: Pandas Library and missingno. The simplest way to create the graph is to write this code:

```
1 import pandas as pd
2 import missingno as msno
3 df = pd.read_csv('VIAU_DHAI.csv')
4 msno.heatmap(df)
```

Figure 20 is simply a table which displays the correlation coefficients for different variables. The matrix depicts the correlation between all the possible pairs of values in a table. It is a powerful tool to summarize a large dataset and to identify and visualize patterns in the given data. Indeed, a correlation matrix consists of rows and columns that show the variables. Each cell in a table contains the correlation coefficient. In addition, the correlation matrix is frequently used in conjunction with other types of statistical analysis. For instance, it may be helpful in the analysis of multiple linear regression models. Remember that the models contain several independent variables. In multiple linear regression, the correlation matrix determines the correlation coefficients between the independent variables in a model. The value in each cell lies between -1 and 1. A correlation matrix is used to

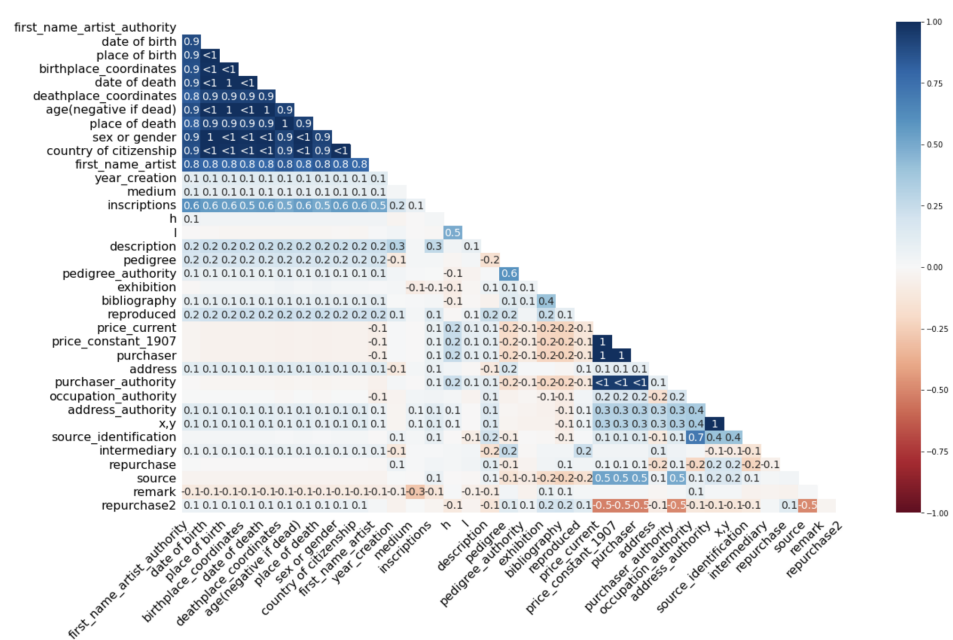


Figure 20: Correlation matrix of our dataset generated by Henrik Abgaryan

summarize data, as a diagnostic for advanced analyses and as an input into a more advanced analysis. The two key components of the correlation are the magnitude (the larger the magnitude, the stronger the correlation) and the sign (if it is positive, there is a regular correlation. If negative, there is an inverse correlation).

Applied to our dataset, this correlation matrix (Fig 20) thus shows that the hammer price, in constant 1907 francs, seems positively correlated with the height and the length of the artwork, its inscriptions, its pedigree and the reproduction in the catalogue. By isolating some variables, this link seems to be confirmed. Indeed, figure 21 displays a positive relationship between the area of the artwork and its hammer price.

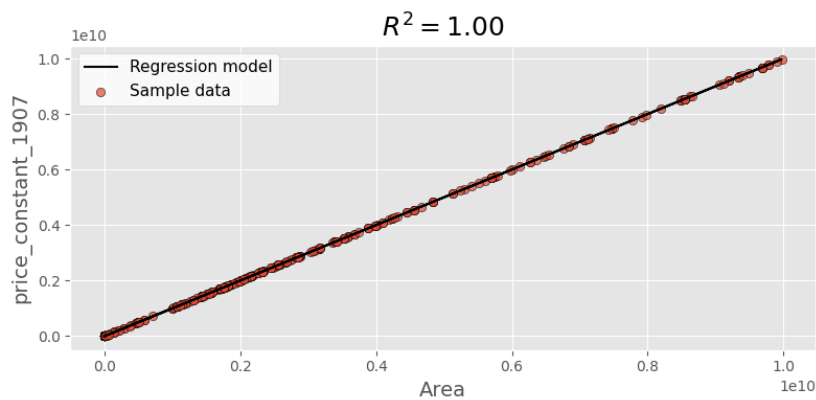


Figure 21: Dependency of painting area with the constant price in 1907 by Henrik Abgaryan and Alexis Georgiou

To continue the econometric analysis, a basic tool is the multiple linear regression model - for artistic prices, the hedonic regression method. The purpose of this technique is to describe how an

“explained variable” varies according to different “explanatory variables”. The hedonic regression method remains descriptive: it highlights correlations but does not reveal causalities. Its advantage is to make comparisons “all other things being equal”, i.e., pretending that all the observed characteristics are unchanged, except for the explanatory variable in question.

The explained variable of our dataset is the hammer price, in constant 1907 francs, computed with a logarithm transformation, which allows a reading in percentages. In the results table 1 displayed in the appendices, each explanatory variable corresponds to a line, and a figure, or coefficient, corresponds to the “direction of correlation”. If the number is positive, then the correlation between the explained variable and the explanatory variable varies in the same direction. For more rigor in the regressions, it is possible to add a “fixed effect”, i.e. to perform this regression technique by separating various entities, or groups. For our analysis, we decided to compute regressions with a fixed effect "catalog" (second column of table 1) and a fixed effect "artist" (third column of table 1).

The results can be reproduced by running this code with R software:

```
1 install.packages("DAAG")
2 install.packages("plm")
3 library (DAAG)
4 library(plm)
5 dataviau <- read.csv2("the_path_to_the_csv", header=T, as.is=T)
6
7 regression_catalogue_fixed_effect<-plm(lnprice ~ height + signed + length_description +
  + pedigree + exhibition + bibliography + painting + pastel + sculpture + portrait +
  + landscape + nude + reproduced + dealer,
8       index=c("id_sale"), model="within",
9       data=dataviau)
10 summary(regression_catalogue_fixed_effect)
11
12 regression_artist_fixed_effect<-plm(lnprice ~ height + signed + length_description +
  + pedigree + exhibition + bibliography + painting + pastel + sculpture + portrait +
  + landscape + nude + reproduced + dealer + factor(id_sale),
13       index=c("id_artist"), model="within",
14       data=dataviau)
15 summary(regression_artist_fixed_effect)
```

After this long methodological detour, it is possible to identify significant correlations of certain variables with the hammer price of works in the Viau collection (Table 1). As a matter of fact, the hammer price increases if the artwork is a painting and a pastel (fixed effect "artist") rather than a drawing or a sculpture; it also increases with the height of the work. Other variables, which are not specific to the works but relative to their symbolic valuation in the auction catalogue, are also correlated with the economic value. Indeed, the hammer price increases with the length of the description in the auction catalogue (within a same catalogue), the mention of a pedigree (for a fixed effect "artist"), the mention of a previous exhibition for the work and, above all, with the presence of a reproduction of the artwork in the catalogue. These results are consistent with the overall econometrics for the artworks sold at auction during the same period, in Paris[8, 9].

4.3 Purchasers and intermediaries

An analysis of the secondary art market for the Viau collection would be incomplete without a study of the players, particularly the buyers. It should be noted that the minutes of the auction sales had a blind spot until about the 1930s[9]: only the final bidder was mentioned, not the buyer. The minutes of the 1942 and 1943 sales, on the other hand, make explicit the relationship between the winning bidder and the buyer for which the bidder acted, for example by indicating that the artwork was acquired by "Mr. X for Mr. Y".

The recognition of the buyers happened to be a long investigation. Of the 210 successful bidders, only 63 could be identified, or barely 30%. If we relate this figure to purchases, 284 artworks were bought by some unidentified actors, 184 by art market professionals, 54 by identified buyers (who were not art dealers), 7 by the Louvre Museum and 7 were not sold. However, the most important bidder,

by volume of purchases, was George Viau himself and his heirs, with 103 (re)purchases - because they might have considered that the hammer price was not high enough. A closer look at the most important buyers, both in terms of volume (Fig 22) and total value of purchases (Fig 23), reveals some salient players.

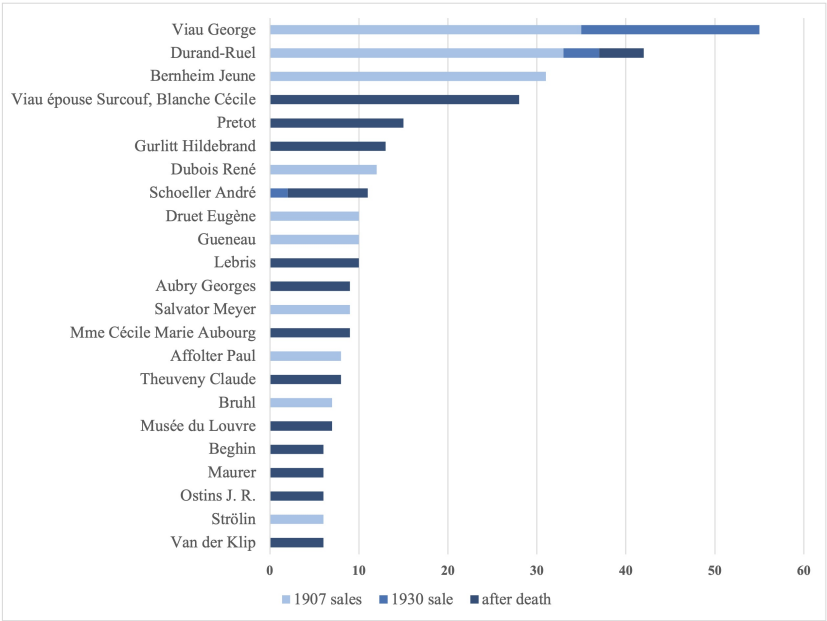


Figure 22: Most important buyers, sorted by the number of artworks they bought at auction. Visualization : Léa Saint-Raymond

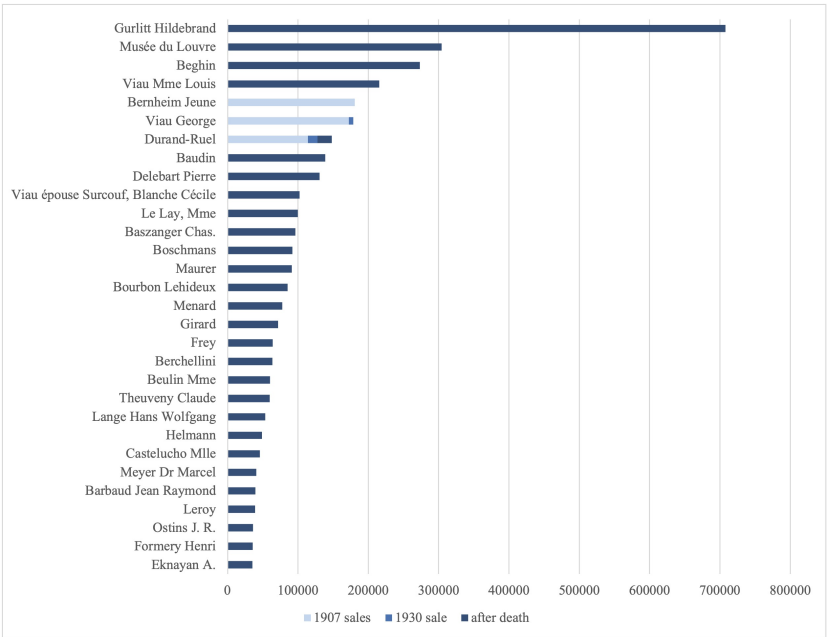


Figure 23: Most important buyers, sorted by their total purchases at auction, in constant 1907 francs. Visualization : Léa Saint-Raymond

The most recurrent buyer was George Viau (55 purchases), followed by Durand-Ruel (Paul in 1907, and his sons Charles and Pierre afterwards, with a total of 42 artworks), Bernheim Jeune (31 artworks) and Viau's widow (28 artworks that she (re)purchased in 1942 and 1943). They were the only purchasers to buy more than 20 artworks. It is interesting to note that Durand-Ruel and Bernheim Jeune were the experts of the 1907 Viau sale. In value, the ranking changes slightly. Hildebrand Gurlitt - a German art dealer and art historian implicated in Nazi looting - spent by far the most on the Viau collection, with a total 10,011,200 current francs for 13 works at the 1942 sale. The Musée du Louvre came in second, purchasing 7 works in 1942 and 1943 for a total price of 4,305,500 current francs, 2.3 times less than the amount Gurlitt spent.

Among the remarkable actors, the Parisian art dealer André Schoeller^[4] was the expert of the 1930, 1942 and 1948 auction sales. Another Parisian dealer, Georges Aubry only bought paintings classified as the "école française", without autorship (6 paintings, 1 drawing-watercolor). The other two acquisitions were drawing-watercolors by Delacroix and Bonnard. All the acquisitions were made in the 1943 auction. Finally, the sculptor Paul Paulin was one of the purchasers in the first Viau's sale. He bought two artworks by Jongkind and one of Guillaumin. At the last sale of Viau, three artworks by Paulin were put to sale: three bronze busts of the French artists Degas, Renoir and Rodin. This relationship shows how the agents of the market could be polyvalent, as Paulin was both artist and collector.¹²

Networks of intermediaries and maps allow analyzing the actors more broadly, even if they are not completely identified. Indeed, when we draw relationships between the purchasers and the persons they asked to bid on their behalf, an interesting networks appears (Fig 24), shedding light on some other key actors of the auction market.

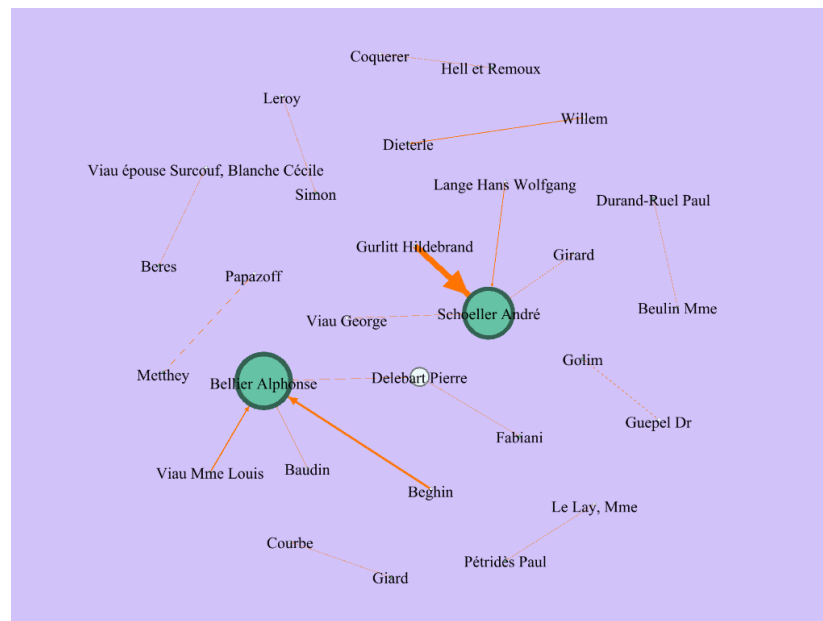


Figure 24: Visualisation of the network between the intermediaries in relation with the purchasers, by Fabriccio M. Novelli Duro

There have been only 12 intermediaries for the negotiation of 38 artworks. If figures such as Durand-Ruel gets our attention, André Schoeller (17 intermediations, being 13 of them for Hildebrand Gurlitt) and the auctioneer Alphonse Bellier (10 intermediations), played a major part as intermediaries

¹²whilst some consecrated artists of that time were both creators and "models", being in the collection as authors of their work and as the object of representation by others. Although the busts are not dated, we could suppose that they were made after their death.

in the 1942 auction sale. According to the data, the purchasers seemed to be "loyal" to the intermediaries (i.e. they commissioned only one person to bid on their behalf), except in the case of Pierre Delebart, who purchased one work through Alphonse Bellier and another through the Parisian dealer Martin Fabiani.

Finally, the addresses mentioned in the minutes make it possible to extend the analysis to a larger set of unidentified actors. In total, 132 buyers could be mapped, i.e. a little less than two thirds (Fig 25).

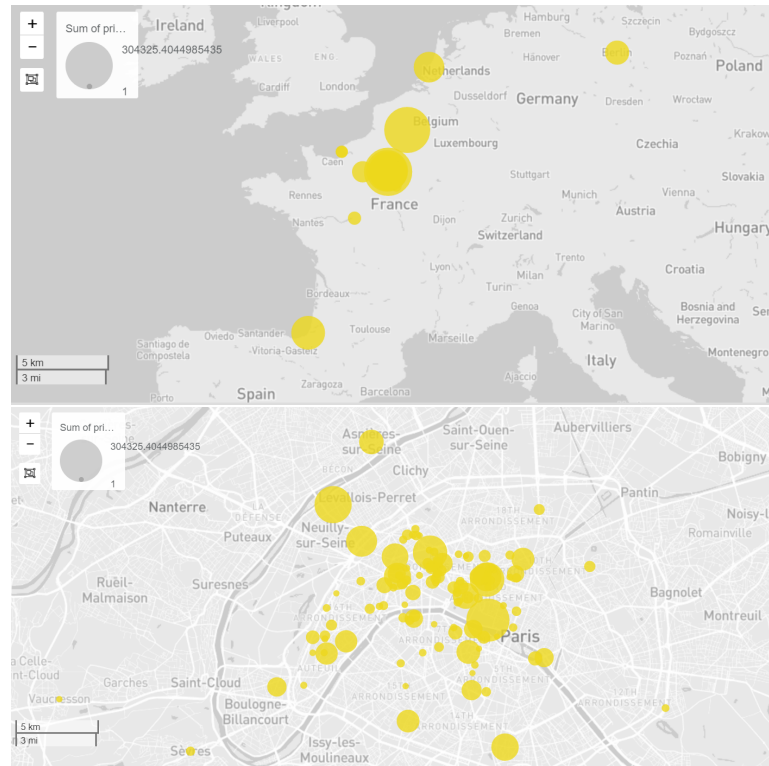


Figure 25: Maps of purchasers localization and amount of sales by buyers (and zoom), by Jade Nijman

As the purchasers were very diverse, this visualization tries to establish the ratio of sales, for each purchaser (in 1907 constant francs), from 1907 through 1943, and to map this information by using the geographic coordinates of the addresses of the purchasers. The first map (Fig 25) was made with Palladio, a graphical interface made for humanistic inquiry, developed by Stanford University to design maps, graphs and tables. Here, each circle represents a purchaser and the position of the circle on the map depends of his or her address. When clicking on a circle, the name of the purchaser appears, with the total amount of sales that he/she realized. The size of the circle depends on this amount : the more the purchaser spent, the bigger the circle. The second map (Fig 25, at the bottom) is simply a closer view of the map, because Palladio doesn't allow exporting qualitative visualizations.

These two maps show us that purchasers were mostly French and very sensibly Parisian (living in the richest neighbourhood, i.e. the Western part of Paris, Neuilly and Boulogne-Billancourt). But we also see that there were buyers living in the South and in the North of France (M. Beghin, unidentified, lived in Cambrai and Pierre Delebart, in Biarritz), in the Netherlands (M. Boschmans and Dr Guepel, unidentified, who both gave an address in The Hague), and Germany (the dealers Paul Cassirer in 1907, and Hans Wolfgang Lange in 1942).

It is also possible to make a more permanent map by using the Folium library in Python, with this code:

```

1 df = pd.read_csv("viaucarto.csv", delimiter = ',', decimal = ',')
2 df = df.fillna(0.001)
3 map = folium.Map(location = [48.86, 2.34], tiles = 'openStreetmap', zoom_start=12)
4 for i in range(len(df["nom"])):
5     x = float(df["x"][i])
6     y = float(df["y"][i])
7     total = float(df["total"][i])
8     early = float(df["early"][i])
9     middle = float(df["middle"][i])
10    death = float(df["death"][i])
11    popup = str(df["nom"][i])
12
13    total_perc = 1
14    early_perc = early / total
15    middle_perc = middle / total
16    death_perc = death / total
17
18    rT = math.log(total)
19    rD = math.sqrt((early_perc+middle_perc+death_perc) * (rT**2))
20    rM = math.sqrt((early_perc+middle_perc) * (rT **2))
21    rE = math.sqrt(early_perc * (rT **2))
22
23    folium.CircleMarker(location = (x,y), popup = popup, radius = 1.1* rT, color = '
24    black', fill = True, fill_opacity=1).add_to(map) #total
25    folium.CircleMarker(location = (x,y), popup = popup, radius = rD, color = 'white',
26    fill = True, fill_opacity=1).add_to(map) #death
27    folium.CircleMarker(location = (x,y), popup = popup, radius = rM, color = 'red',
28    fill = True, fill_opacity=1).add_to(map) #middle
29    folium.CircleMarker(location = (x,y), popup = popup, radius = rE, color = 'blue',
30    fill = True, fill_opacity=1).add_to(map) #early
31
32 map.save('Purchasers.html')

```

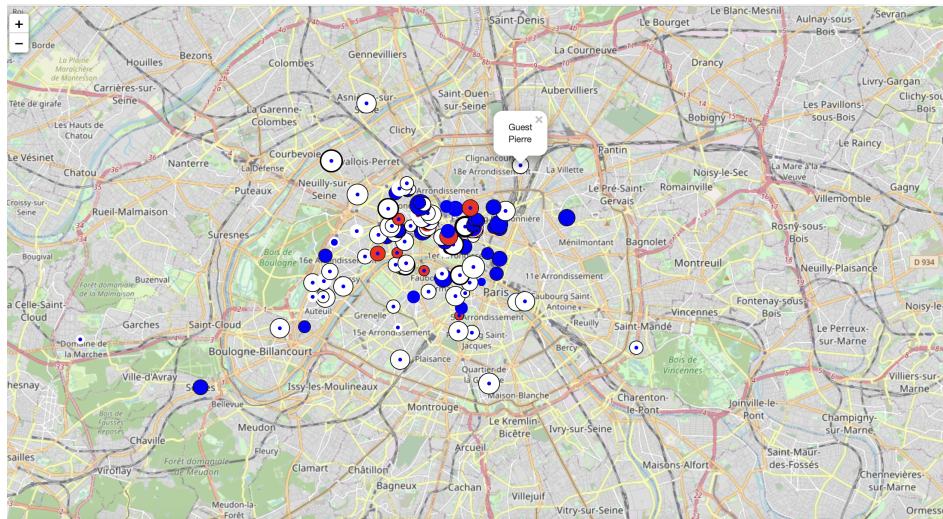


Figure 26: Location of purchasers and the money they spent in each auction, with a zoom in the Parisian area, by Alexios Lazaros Georgiou

This interactive map in html format (Fig 26) allows visualizing the three periods at once (the early and first sale (1907) in blue, the middle one (1930) in red and the ones after Viau's death (1942, 1943) in white). Each node represents a purchaser's location and the area of each sub-circle is proportional to the amount of money spent on each auction. This map gives similar conclusions as the ones made with Palladio (Fig 25) but it also highlights the fact that the amount of the expenses, in constant francs,

was much bigger during the 1942-1943 sales and that foreign purchasers became the biggest buyers.

5 Conclusion

The use of a computational method has thus revealed some salient features of George Viau's collection, its relative stability between the first sale in 1907 and his death, and it has shed light on the determinants of the hammer price and the characteristics of the secondary art market. These initial conclusions would individually deserve further investigation. The use of statistics, econometric methods, maps and networks nevertheless highlights some avenues of analysis to be explored in greater depth, for example, key artists in the collection (Edgar Degas), the importance of nude painting in the first half of the 20th century, or some buyers who would otherwise have been invisible (e.g., the sculptor Paul Paulin, the Biarritz buyer Pierre Delebart, or even the Berlin dealer Hans Wolfgang Lange)

Moreover, this analysis in "paper format" is best complemented by the Digital Viau library (online) and interactive visualizations, such as the buyers' map created with Python, which allows for an even finer approach than is possible with a fixed visualization, constrained by the format of an article. This is the reason why the study of collections - especially when they include a significant number of works - must include a digital humanities component. A pioneer example is the JDCRP pilot project, directed by Avishag Ben-Yosef and Marc J. Masurovsky and completed in July 2021, which aims at studying the Adolphe Schloss Collection.¹³ Having also marked the period of the Occupation, George Viau's collection also deserves an interactive and quantitative treatment: the Digital Viau website gives access to a digital library of artworks, artists, former owners - before Viau - and buyers. The next step is to complete this website, by adding private transactions to the already established corpus of auctions, and to add network visualizations and maps.

¹³<https://pilot-demo.jdcrp.org>, accessed on December 8, 2022.

6 Appendix

Table 1: Hedonic regression of the hammer price of the artworks from the Viau collection in constant 1907 francs and expressed in neperian logarithm. Econometrics: Léa Saint-Raymond

Variable	Fixed effect "catalog"	Fixed effect "artist"
height	0.004 *	0.006 **
	(0.002)	(0.002)
signature	0.242	0.064
	(0.125)	(0.132)
description length	0.004 ***	0.000
	(0.000)	(0.000)
pedigree	0.406 ***	0.009
	(0.122)	(0.119)
exhibition	0.400 **	0.286 *
	(0.133)	(0.111)
bibliography	0.287	0.309
	(0.222)	(0.182)
painting	0.478 ***	1.073 ***
	(0.120)	(0.126)
pastel	0.349	0.619 ***
	(0.187)	(0.165)
sculpture	-0.007	1.117
	(0.305)	(0.688)
portrait	0.096	0.172
	(0.135)	(0.124)
landscape	0.027	0.127
	(0.112)	(0.113)
nude	0.381 *	0.207
	(0.179)	(0.157)
reproduced	1.391 ***	0.964 ***
	(0.139)	(0.117)
dealer	0.141	0.117
	(0.099)	(0.084)
1907 sale	—	0.741 ***
		(0.161)
1930 sale	—	0.204
		(0.164)
1942 sale	—	2.939 ***
		(0.165)
1943 sale	—	1.456 ***
		(0.084)
Nb of obs	570	570
F statistic	30.8671 on 14 and 550 DF	57.8024 on 18 and 431 DF
p-value	< 2.22e-16	< 2.22e-16
Multiple R ²	0.44	0.71
Adjusted R ²	0.42	0.61

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Acknowledgement. This paper is the outcome of the PSL Intensive Week in Digital Humanities and Artificial Intelligence, organized by the DHAI team between November 21 and November 25, 2022. It allowed students to learn about computational data analysis and to carry out this project, under the supervision of Léa Saint-Raymond. Many thanks to Scott Trigg for his precious help in organizing this PSL Week.

References

- [1] Antoine Courtin and Léa Saint-Raymond. Enriching and cutting: How to visualize networks thanks to linked open data platforms. *Artlas Bulletin*, 6(7), 2017.
- [2] Julien Caverio Félicie de Maupeou and Léa Saint-Raymond. Geomap, géographie du marché de l’art parisien. <https://paris-art-market.huma-num.fr>, 2017.
- [3] Philippe Gambette and Jean Véronis. Visualising a text with a tree cloud. In *Classification as a Tool of Research, Proc. of IFCS’09 (11th Conference of the International Federation of Classification Societies)*, pages 561–570, 2010.
- [4] Maximilien Lecordier. *André Schoeller et les ventes de la succession George Viau sous l’Occupation: l’exceptionnelle économie du marché de l’art pendant la Seconde Guerre Mondiale*. Master Dissertation, Ecole du Louvre, dir. Camille Morando, 2022.
- [5] Nathalie Moureau and al. Collectionneurs d’art contemporain : des acteurs méconnus de la vie artistique ? *Cultures Etudes*, 1, 2015.
- [6] Emmanuelle Polack. *Le marché de l’art sous l’Occupation. 1940-1944*. Paris, Tallandier, 2019.
- [7] Léa Saint-Raymond. Les ventes aux enchères de tableaux, arts graphiques et sculptures à paris (1831-1925) : artistes, prix et adjudicataires. *Harvard Dataverse*, 2018.
- [8] Léa Saint-Raymond. Revisiting harrison and cynthia white’s academic vs. dealer-critic system. *Arts*, 8(3), 2019.
- [9] Léa Saint-Raymond. *A la Conquête du marché de l’art : le Pari(s) des enchères, 1830-1939*. Paris, Classiques Garnier, 2021.
- [10] Léa Saint-Raymond. Vers une histoire élargie des collections ? les annuaires artistiques des collectionneurs au prisme des humanités numériques. *Histoire de l’art*, 19(87):137–148, 2021.
- [11] Léa Saint-Raymond and Hadrien Viraben. The virtual collection of alexandre berthier, prince of wagram. *Nineteenth Century Art Worldwide*, 19(2), 2020.
- [12] Christian Theuveny and Claude Petit-Castelli. *George Viau, un amateur éclairé. 50 ans de collection d’un ami des impressionnistes*. Louviers, HB Impressions, 2018.