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Abstract

Proper inventory management is crucial for art galleries since the art market is highly illiquid, subject to periodic changes in tastes and that inventory represents one of the main costs of galleries. Yet, despite its importance, inventory management has been overlooked in the literature. This paper distinguishes four main strategies used by art dealers to manage their inventory: relying on commissions, on consignments, on speed of sale or on large inventories. We use this classification to set the inventory strategy of Goupil, Boussod & Valadon, a major art gallery active in France at the end of the 19th century, into perspective. Goupil’s books cover the sale of more than 25,000 artworks between 1860 and 1914. Rapidity to sell was a key element in Goupil’s strategy. Out of the sold artworks, almost 75% were sold within a year. Artworks which had been in inventory for a long time sold at a discount. Goupil required a slightly higher mark-up for artists from which he held a large inventory. Mark-up for artists in residence were lower, suggesting Goupil was ready to make a discount to establish their market. The likelihood to sell their artworks at a loss was also lower, signaling a preoccupation for their long-term market.

JEL Classification: N14, N44, Z11

Keywords: Art market, Art Investment, Art Gallery, French Economic History

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Art Dealers' Inventory Strategy

The case of *Goupil, Boussod & Valadon* from 1860 to 1914

ABSTRACT

Proper inventory management is crucial for art galleries since the art market is highly illiquid, subject to periodic changes in tastes and that inventory represents one of the main costs of galleries. Yet, despite its importance, inventory management has been overlooked in the literature. This paper distinguishes four main strategies used by art dealers to manage their inventory: relying on commissions, on consignments, on speed of sale or on large inventories. We use this classification to set the inventory strategy of Goupil, Boussod & Valadon, a major art gallery active in France at the end of the 19th century, into perspective. Goupil's books cover the sale of more than 25,000 artworks between 1860 and 1914. Rapidity to sell was a key element in Goupil's strategy. Out of the sold artworks, almost 75% were sold within a year. Artworks which had been in inventory for a long time sold at a discount. Goupil required a slightly higher mark-up for artists from which he held a large inventory. Mark-up for artists in residence were lower, suggesting Goupil was ready to make a discount to establish their market. The likelihood to sell their artworks at a loss was also lower, signaling a preoccupation for their long-term market.

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Art Dealers' Inventory Strategy

The case of *Goupil, Boussod & Valadon* from 1860 to 1914

Introduction

A large academic literature has been dedicated to the prices of artworks, with a focus on art as an investment vehicle[1]. Because of data constraints, the literature has been relying on auction house data to construct price indices and this, even though galleries represent a very substantial part of the art market. Velthuis (2005, p. 14) values the size of the US auction market at 1,298 million USD to be compared with the art dealers' market estimated at 2,834 million USD. Dealers' markets are also larger than auction markets in France (Gaillard, 1999) and in The Netherlands (Velthuis, 2005). Estimates that are more recent conclude that focusing solely on auctions may lead to the omission of as much as 75% of the market activity (De Marchi, 2019, p. 18). As for record-breaking sales, many were done outside auction houses such as for example the 137.5 million USD sale of Woman III from Willem de Kooning orchestrated by Larry Gagosian (Vogel, 2006).

The limited number of studies focusing on data from galleries is easy to understand: as going-concerns, buyers and sellers put a high price on discretion. Discretion is so important that according to a Swiss art dealer: "To be invisible is the

[1] See for example Baumol, 1986; Campbell, 2008; Frey and Pommerehne, 1989; Pesando, 1993; Ginsburgh and Buelens, 1992; Goetzmann, 1993; Mei and Moses, 2002; Oosterlinck, 2017; and Renneboog and Spaenjers, 2013.

best way to make business" (Knight, 2016). When galleries are mentioned in existing literature it is mostly to stress the role of some gallery owner in shaping artists' careers. For example, the role of Paul Durand-Ruel, Daniel-Henri Kahnweiler or Leo Castelli in developing markets for their *protégés* has been discussed in detail by art historians and economists working on artists' wages and creativity[2]. The academic literature rarely analyzes the way galleries operate and the challenges faced by their owners. These topics are usually left to market participants themselves (who may lack objectivity) or to a more professionally oriented literature (Winkleman, 2009 for example).

An analytical approach to the management of galleries is however crucial in view of their low survival rates, especially for small and mid-sized galleries[3]. This paper focuses on the management of their inventory. In most businesses, inventory management is important as large inventories, created for example by too low turnovers, put a strain on the finances of companies. Arguably, inventory management is even more important for art galleries. Inventory and rent represent indeed galleries' largest expenses (Shubik, 2003). Whereas for consumption goods several methods may be used to evaluate demand, for artworks demand is highly uncertain. In this case, the literature highlights the need to create a safety (or buffer) stock (Wild, 2002). This need is reinforced when supply cannot be guaranteed; as is the case for the art market. Guaranteeing a large supply is however not easy for galleries since they are often undercapitalized (Cooper, 1985, p. 45) and therefore less able to finance large inventories. When they are able to finance large inventories - Gee, (1981, p. 70) mentions that in the 1930s, for several galleries, the value of the stock exceeded the

[2] See for example Assouline (1988) and (2002); Galenson and Jensen (2002); Gee (1981); Moulin (1967).

[3] See for example Robin Pogrebin "Art Gallery Closures Grow for Small and Mid-Size Dealers", *The New York Times,* 25 June 2017.

declared capital of the company – they face the risk of not being able to roll over the credits used to finance the inventory. Inadequate inventory management thus poses a direct threat to galleries' survival (Moulin, 1967; Horowitz, 2011). Milo (1980, p. 66) explicitly mentions the large inventory of artworks by René Magritte in 1932, when his market was not as established as today, as one of the reasons of the failure of the Centaure Gallery. Horowitz (2011, p. 197) reports the difficulties faced by Hue-Williams Fine Art following the recent financial crisis and the role played by a reduction in the gallery's turnover of more than 50 percent. The question of inventory remains thus an important one nowadays. Galleries with relatively limited means tend to have the smallest inventories possible (Mahé de Boislandelle, 2005, p. 185). This approach minimizes risk but it might also limit the ability to sell. Managing inventory is thus key if galleries are undercapitalized. For galleries with better access to finance, turnover is nonetheless also important because of the costs associated to holding artworks. Besides the financial costs, related to the need to finance the inventory, art dealers have also to take into account storage and insurance costs. Yet, despite its importance, inventory management has been overlooked for the same reasons that plague research on art galleries in general: secrecy.

During the 19th century, and of special interest here, the common practice was for dealers to directly buy from artists and hold works in inventory (Velthuis, 2005, p. 61). In some cases, artworks remained in inventory during decades and represented a real financial burden for the dealers. Dealers with enough financial means created a stock of works from a given artist in the hope to see the prices of these works increase (Gee 1981, pp 41-42; Vollard, 1989, p. 351). Contractual relationships could however also prove disastrous for dealers if the hoped-for-success did not materialize. In this case, and as pointed out by Milo (1980, p. 63), "The merchant is quickly overwhelmed by the paintings that accumulate in his shop or gallery".[4] Building inventories means indeed tying up resources, an element which threatened the survival of the business run by Paul Durand-Ruel (Durand-Ruel and Durand-Ruel, 2014, p. 95). When capital was missing and art merchants had to borrow to build up their inventories, credit could also jeopardize their future. Durand-Ruel for example mentions his business dealings with usurers (Durand-Ruel and Durand-Ruel, 2014, pp. 107, 121). Symptomatic of this desire to support "his" artists, at his death all of Paul Durand-Ruel's wealth was invested in the stock of his firm and his gallery (Distel, 1990, p. 31).

Because they are often undercapitalized and because of the uncertainty regarding the potential future success of lesser-known artists, galleries face specific challenges when it comes to inventory management. Galleries have adopted several strategies to address this challenge (Fage, 1930; Gee, 1981; Jensen, 1994; Moulin 1967; Velthuis, 2005). In general, it seems that art dealers rely on four main strategies:

1) The first strategy consists in buying artworks following a client's commission. In this case, the role of the dealer is limited to intermediation, and as a result, the dealer has no inventory. Fage (1930) labels these dealers, the marchand-courtiers. Instead of having a stock of artworks, they work as brokers buying only artworks for which they already have a client. George A. Lucas, a contemporaneous actor of Goupil, worked for example in this way (Lucas [1979]). This activity was not reserved to established art dealers but also commonly practiced by heirs of noble families (Moulin, 1967). Artists themselves sometimes also acted in this fashion as was the case of the Dutch

[4] « Le marchand se trouve bien vite écrasé par les tableaux qui s'accumulent dans sa boutique ou sa galerie ».

painter G. Broens. They often worked then for major collectors (Stolwijk, 1998, p.196).

2) The second strategy, very close to the first one because it does not require keeping an inventory, is to work with consignments. For contemporary art, the uncertainty regarding the ability to sell artworks from a non-established artist renders the acquisition of a large stock of artworks extremely risky. Consignments allow minimizing the risk. The artists consign the artworks to be sold to the dealer who is in charge of exhibiting them. The proceeds of the sale are then divided between the two according to an agreed-upon ratio (Velthuis, 2005, p. 61). Consignments have become common since World War II because they allow sharing risk and reducing the requested capital. This strategy is of course hardly feasible for artworks from deceased artists or antiquities. Heijbroek and Wouthuysen (1999, p. 55) mention that, in the 19th century, the Dutch firm Van Wisselingh relied on this approach but gradually moved to acquiring artworks because the margin for the firm itself was higher in this case.

3) The third strategy, especially present for dealers with limited resources, aims at limiting the financial burden of inventory by guaranteeing a large turnover. This practice was already common in the 19th century. In his *Carnets d'Enquête*, preparatory notes supplied by the painter Antoine Guillemet for Emile Zola's novel *L'Oeuvre*, Zola [1986] mentions some French art dealers relying on quick turnover. For example, the art dealer Martin, located rue Lafitte, followed a strategy described as follows "His entire system was based on the rapid renewal of his capital. He bought at low prices, resold immediately with a profit of twenty percent, thus operating on small figures, with small capital and fast turnover."[5] (Zola, [1986], p. 242). For the interwar period, Gee, (1981, p. 42)

[5] « Tout son système était basé sur le renouvellement rapide de son capital. Achetait à bas prix, revendait tout de suite avec un bénéfice de vingt pour cent, opérait ainsi sur de petits chiffres, avec un petit capital et un roulement rapide. »

mentions that some dealers were forced to sell almost as fast as they bought. This observation is still valid nowadays. Jeremy Cooper (1985, p. 45), a former art dealer, highlights for instance the importance of speedy sales because art dealers are usually undercapitalized and need cash flows.

4) The fourth strategy is for art dealers to rely on a large inventory. This strategy is capital-intensive and may therefore be hard to sustain. Moulin (1967) distinguishes two approaches within this strategy. The first approach is to create a large inventory of well-established artists and to buy continuously on the market when opportunities arise. This is the approach favored by the Wildenstein dynasty (Moulin, 1967, pp. 102-103). According to the journalist and art dealer Georges Bernier (1977, p. 341), in this case, margins have to be high because the low speed of sales forces art dealers to fund a large inventory. The second approach is to focus on the artists "discovered" by the dealer. Then, the dealer often requires a right of first refusal or a monopoly on the artists' production[6]. At the beginning of the 20th century, it became more and more frequent for art dealers to enter in a contractual relationship with artists to buy their production in exchange of a fixed sum. The dealers Paul Durand-Ruel, Daniel Henri Kahnweiler and Ambroise Vollard all relied on this approach (Moulin, 1967, p. 114, Velthuis, 2005, p. 61). The Belgian banker and art dealer Gustave Coûteaux also followed a strategy involving a large inventory (Baetens, 2010).

These different strategies allow setting art dealer's practices in an analytical framework. This does not mean however, that art dealers adopted only one strategy, nor that they could not change their strategy as their business evolved. Ambroise

[6] Historically, artists could be directly employed by courts (Warnke, 1993; Bätcshmann 1998). This direct relationship is nowadays uncommon.

Vollard is for example mostly associated to the fourth strategy presented earlier. Yet, at the beginning of his career, he relied on the first strategy, and in general only bought artworks if he already had a client (Morel, 2007, p. 278). The same holds for Paul Durand-Ruel. Even though his general strategy was to discover new artists and hold a large inventory of their work, at the beginning of his career he sometimes followed a different approach. Kelly (2014) mentions for instance that when acquiring works together with the dealer Hector Brame, the objective was to sell fast even if it meant a low margin.

The aim of this paper is to determine to which extent an important art dealer such as Goupil used one or more of these strategies. There are indeed, to the best of our knowledge, no quantitative analyses of art galleries' inventories. De Silva et al. (2017) provide quantitative information regarding dealers' buying strategies. They rely on auction data compiled by Algernon Graves, a British art dealer, for a period starting in 1850 and ending in 1913. They document the rising importance of art dealers as buyers at auction. Their analysis shows that large dealers, defined as dealers with a market share of 10% or more, were bidding more aggressively. The authors attribute this observation to large dealer's ability to better promote artists and to therefore extract a higher rent from the sales of artworks.

Whereas galleries still active today cannot be quantitatively analyzed because of disclosure limitations, history provides a way to assess their strategy. This is the approach chosen for this paper, which focuses on one of the most successful French galleries active during the end of the 19^{th} and beginning of the 20^{th} century: the Maison Goupil and its successor Boussod and Valadon. Goupil's archives are unique in many respects. First, its books are complete for a long time-span, something exceptional for the period under consideration as many art dealers at the time had only rudimentary accounts[7]. Second, the books span a large period (1846-1919) and record the sales of more than 25,000 artworks. Based on this unique database, the paper analyses the inventory strategy of Goupil and sets it into perspective with the four strategies described earlier. Goupil's books give insights on the number of works commissioned. This provides information regarding the first strategy. The first and third strategy require selling artworks fast[8]. Based on Goupil's books we therefore assess to which extent Goupil managed to sell its artworks in a rapid way. The fourth strategy is directly linked to inventory management. Thanks to our database, we can track the evolution of the inventory for each of the artists sold by Goupil. The database also allows investigating Goupil's strategy with regard to his inventory since, as a dealer, he could decide to adapt its required mark-up according to the state of his inventory. This could be done at the artwork level. Did Goupil require a lower mark-up for artworks which had been in inventory for a long time? The same approach could be devised at the artist level. Was Goupil trying to build-up a large inventory of given artists and defend the prices of the works by these artists by requiring a high mark-up and thus follow the fourth strategy? Or was Goupil willing to let artworks from artists highly present in its inventory go for reduced mark-up in order to guarantee a large inventory turnover? The database often mentions the name of the buyers. In several instances, we have therefore been able to identify the buyer. As a result, we can control for customers' characteristics (nobles, other gallery owners, large buyers), which could have affected the mark-ups.

Our analysis shows that Goupil relied on a mixed strategy. The first and the third strategy formed the core of his inventory management. An important number of the

[7] Even famous dealers such as Durand-Ruel followed no coherent accounting practices, which, by Durand-Ruel's own account, proved detrimental to his business (Fénéon, 1920).
[8] Works on consignment are harder to identify. Artworks returned to the artists are from time to time mentioned in the books suggesting that Goupil at least sometimes used this approach.

sold artworks were in fact commissions (roughly 1,600 artworks). More than 46% of the artworks, which eventually sold, were sold within 2 months after entering the ledgers. After a year this proportion rises to 74%. Goupil was willing to reduce his mark-up if artworks remained in his inventory for too long. He was therefore clearly following the first and the third strategy presented earlier. He was more ambiguous regarding the fourth strategy as we show that larger inventories for given artists induced him to require a slightly higher mark-up be. However, Goupil did not really use all the strategies of other dealers to sustain the prices of these artists. For instance he was seldom active at auction to support their prices. Artist in residence form an interesting category. Goupil was ready to reduce the mark-up for these artists but was unlikely to sell them at a loss. It is there again a mixed strategy which protects the value of the inventory but does not signal a strong involvement to guarantee the rise in price for artworks by these artists.

The balance of the paper is organized as follows: Part 1 provides a short overview of the history of the art market during the 19th century with a focus on the Maison Goupil. Part 2 presents the dataset, Part 3 the methodology. Part 4 provides the results of the investigation, whereas Part 5 concludes.

I. The Art Market during the 19th century and the Maison Goupil

The art environment in which Goupil operated experienced major changes during the period under study. The French artistic scene was, up until the second half of the 19th century, characterized by a highly hierarchical system. France had created a very centralized system based on two institutions the *Académie des Beaux-Arts* and the *Salon* (a great annual or biennial exhibition). These powerful institutions attracted a high number of painters and as a result, "France possessed by far the largest number of artists" (Jensen, 1988, p. 360). "Would-be-artists" were expected to train at the Académie and, if they were good enough, to present their work in the framework of the Salon, the main if not only, real exhibition place for visual arts (Jensen, 1994). Additional recognition of artists' worth could gradually be gained by winning prestigious prizes (such as the Prix de Rome) or medals at the Salon. As time went by, the system suffered from growing criticisms. Members of the jury were accused of being partial and the increasing number of refused paintings fueled resentment amongst painters. Even though the Salon also served educational purposes, it acted as a major market for art (Chaudonneret, 2007). Indeed, public commissions often depended on recognition by the Salon. Furthermore, many art buyers were relying on the Salon to guide their choice.

White and White (1965) have argued that the Salon system focused essentially on paintings, relegating artists' careers to a second zone. The increase in the number of professional painters rendered the system unsustainable. The impressionists led to the creation of a new system, which White and White (1965) have labelled the "dealer-critic system". They contend that a large number of dealers began to focus on artists' careers. Since dealers were interested in the future success of their protégés, they invested in market development and reputation building. Jensen (1994) and Galenson and Jensen (2002) have criticized this presentation. Galenson and Jensen (2002) point out that impressionists developed their own exhibitions to gain reputation and that art dealers investing in young artists' were the exception, certainly not the norm. Saint-Raymond (2018) stresses, furthermore, that artists, at first reluctant to sell their works directly at auction, became more and more willing to do so. Selling at Drouot, the main auction in Paris, provided publicity for the painters. Even though in some instances results were mediocre, the practice became common during the third quarter of the 19th century.

Our period of analysis is also marked by high political instability regarding the arts with no less than five ministries between 1880 and 1884 (Mainardi, 1993). According to Mainardi (1993, p. 85), "after 1880, the Salon was no longer the official exhibition conferring the approval and the prestige of the state". This change was followed by an important cut in the state budget to acquire artworks. The disappearance of the Salon also meant that artists could no more receive the quality stamp of the salon. This may have had an impact on the ability to sell paintings made by painters who had presented at the salon, as was the case for example for Bouguereau who was represented by Goupil. The Salon was indeed shaping taste and willingness to buy as mentioned by Renoir in 1881 in a letter to Durand-Ruel (Mainardi, 1993, p. 85). By contrast, once the Salon lost its official mark, Mainardi (1993, p. 138) argues that artworks exhibited in private gallery became perceived as more valuable. Etro et al. (2020) suggest that the end of the Salon led to an increase in the prices of impressionist paintings.

Academic interest for the French art market during the 19th century is relatively recent (Green, 1987; Distel, 1990) and an extensive study of the art dealers active in Paris during this period still needs to be undertaken. It is however possible to get an impression of the number of dealers active in the city. De Maupéou and Saint-Raymond (2013) track the number of art dealers registered in the *Bottin du Commerce* between 1815 and 1955. For the period under study, the number of art dealers active in Paris hovered around a 100, with a figure slightly higher at the beginning of the 1870s and slightly lower in the middle of the 1890. By 1890, the market had become highly competitive with a qualitative change (and specialization) in the nature of the art dealers (De Maupéou and Saint-Raymond, 2013). The market for old master paintings and modern paintings was segmented. Gallerists promoting living artists were not necessarily investing in avant-garde movements. Distel (1990, p. 33) suggests however that their number was large. Goupil was mostly following well-established artists. Paul Durand-Ruel and Georges Petit were taking the risks to support the impressionists but most galleries were at first not interested in these artists[9]. As stressed by Galenson and Jensen (2002, p. 22) "For the already well-established artist, the large dealer's gallery was the most convenient means to translate one's reputation into sales. But young, unknown artists were never beneficiaries of large-scale dealer purchases".

Art dealers targeted different market segments but also differed in terms of the quality of the artworks offered for sale (Zola, [1986]; Distel, 1990). As a result, the relationship between dealers depended on the degree of overlap in terms of business. Dealers active in the same market segment were competing to get artists in their stable. In the late 1880s, Georges Petit and even Boussod and Valadon[10] were vying with Paul Durand-Ruel to get the business of some impressionist painters (Distel, 1990, p. 29). Georges Petit was a clear competitor of Paul Durand-Ruel and according to Distel (1990, p. 38), he was his rival "on every front". Despite this competition, art dealers were sometimes accused of forming rings to limit price increases at auction. Such an accusation was voiced by the widow of the art dealer, Père Tanguy, following the sale of his estate at the Hotel Drouot in 1894 (Morel, 2007, p. 281).

[9] Both Georges Petit and Paul Durand-Ruel's fathers, Francis Petit and Jean-Marie Durand had been active in the art market.

[10] This interest for contemporaneous artists was the result of the presence of Theo van Gogh, the brother of Vincent van Gogh, in the firm, the traditional business of Goupil being less progressive.

A major change in the 19th century art market was the growing importance of a truly international art market. Painters had to take into account the potential provided by foreign sales. Jensen (1994) also stresses the growing importance of dealers during the second half of the 19th century. Even well-established painters relied on the efforts of their dealers to gain access to new markets or develop existing ones. The Franco-Prussian war reinforced the need to look for other markets. Paul Durand-Ruel exploited his international network to establish himself in London when the war broke out in 1870 (Robins, 2015). He opened a branch in Brussels in 1872. This international expansion was not unique. Several art dealers established international branches during the period under study. For example, the Dutch firm Van Wisselingh opened a branch in London in 1892 (Heijbroek and Wouthuysen, 1999)[11].

The desire to look for other markets in times of crises prompted Paul Durand-Ruel to enter the US market following the failure of the Union Générale, the bank which had supported him and whose failure had endangered the survival of his business (Distel, 1990, Thompson, 2015 pp. 25-28). The United States also took a more and more important role in the international market for Old Masters during the Gilded Age, when new wealth in the USA sought Old Masters in Europe (Saltzman, 2008). Dealers in the USA did not rely on a stable of artists, as was the case in France (Goldstein, 2000, p. 34). Even though some dealers promoted American artists, there was a strong interest for works from European artists. In the inventory of Knoedler, one of the main dealers in the United States, European works outnumbered American ones (Goldstein, 2000, p. 37). Other dealers with close connections to Goupil such as William Schaus and Company also exhibited expensive European works, and this despite the desire to support American artists (Goldstein, 2000, p.40).

[11] Dumas (1983) provides additional examples.

Goupil operated thus in a truly international but, segmented, art market, with competition both at home and abroad. Goupil was a well-established player in this market. Describing the French art market in a letter from 1889, Emil Heilbut, a German art critic, stressed that Durand-Ruel and Goupil were the oldest art dealers in Paris (Hansen, 2014). The origins of the Maison Goupil may indeed be traced back to the partnership formed in February 1829 between Adolphe Goupil and Henry Rittner. At first, the partnership specialized in prints, reproducing famous artworks for a broad public. The market for such prints was large and many businesses were active in this field. Rittner & Goupil managed however to run the business in a different way. As pointed out by McIntosh (2004, p. 64), "it was the only one to develop a vertically integrated system of reproduction and dissemination that operated seamlessly, wall to wall, from the artist's studio to the collector's parlor and often from there to the museum's galleries". As a result, Rittner & Goupil became one of the major players worldwide in the print business. The death of Rittner, in 1840, prompted Adolphe Goupil to create a new company with another printer, Théodore Vibert (Penot, 2017). This company first named Goupil & Vibert[12], and from 1846 on, Goupil, Vibert & Cie specialized in the sale of prints. Soon, the success was such that the workshops of the company had to be relocated to get additional space. At the same time, the company developed a broad international network to expand its business (Penot, 2010). A large proportion of the company's activities were thus conducted abroad. Expansion took the form either of a joint venture or in some instances led to the creation of a branch

[12] The company changed name several times over our period of study, for the sake of simplicity, we often refer in the text to Goupil, this chronology provides however the exact denominations and their evolution.

of the mother company (Penot, 2010). The company opened a branch in New York in 1848 and began a close relationship with the Van Gogh[13] gallery in The Hague in 1846.

The death of Vibert, in 1850, led once again to a change in name, the new business becoming Goupil & Cie. A new associate, Léon Boussod joined a few years after. The core of the business remained the sale of prints up until 1860 as shown by the inventory of paintings held by Goupil (Penot, 2017). From 1850 to 1860 however, the business gradually changed and by 1860, selling paintings had become the main business of the company. In 1853, Goupil began to have artists in residence. This observation is consistent with Green's (1987) assertion that by the end of the 1860s dealing in contemporary art had become a distinctive economic practice. After 1865, the number of artists in residence increased substantially (Penot, 2017). If one considers the 19th century, more than 117 artists spent at least some time in Goupil's main building located rue Chaptal. Establishing close personal relationships with artists was not exceptional for 19th century art dealers, as they often saw themselves as latter-day descendants of aristocratic patrons. For example, in 1878 Charles Sedelmeyer signed a ten years exclusive contract with the highly decorated painter Mihály Munkácsy (Huemer, 2004). Goupil specialized also in well-established artists. When William Adolphe Bouguereau signed a twenty years exclusivity contract with Goupil, in 1865, he had already won prestigious prizes in France such as the Prix de Rome or a medal at the Salon (Galenson and Jensen, 2002). The dealer Paul-Durand-Ruel recalls how Goupil managed to convince Bouguereau to work exclusively for him by promising double the amounts Durand-Ruel could afford to pay (Durand-Ruel and Durand-Ruel, 2014, p. 31). Exclusivity contracts were not limited to France, the list of dealers and artist engaged in such agreements is impressive (Baetens, 2020). The Hague-based branch of Boussod

[13] Run by Vincent Van Gogh, the uncle ("Uncle Cent") of his homonym, the painter.

and Valadon had for example an exclusivity contract for the works of the Dutch artist Jacob Maris (Heijbroek and Wouthuysen, 1999, p. 90). Exclusive contracts and residences are of course different but both practices reveal how common it was for dealers to have an exclusive relationship with artists they supported.

During these years, the company pursued its international strategy by opening a branch in London in 1857 – following the one in Berlin of 1852. In a few years, the branches managed to play a central role in Goupil's strategy with very strong links established between the London and The Hague branches. Using network analysis, Fletcher et al. (2012) show that by 1875, the London branch played a central role. As for the New York branch, its success was such that its manager, William Schaus, resigned to open his own gallery (Goldstein, 2000). The successor, Michael Knoedler, substantially developed the business and eventually bought it from Goupil in 1857 (Penot, 2017). By 1861, Goupil had managed to open three galleries in Paris and four abroad. This year marked the beginning of an official association with Vincent Van Gogh. From then on, the business of paintings would become the most important one. The important number of branches provided diversification benefits and thus allowed spreading the risks (Helmreich, 2011). The years 1870-1884 marked, according to Penot (2017), the consecration of the company. In 1878, Vincent Van Gogh retired to be replaced by René Valadon, Boussod's son in law. In 1884, the company changed name again to become Boussod, Valadon & Cie, *successeur de Goupil et Cie*. The prosperity of Boussod and Valadon started fading away at the turn of the 20th century, mainly because of a change in taste and fashion. It went eventually bankrupt in 1917 and the company was liquidated between 1917 and 1921.

II. Data and Descriptive statistics

The data series used in this paper have been culled from the fifteen Goupil books preserved at the Getty Research Institute (GRI)[14]. The books report all artworks' transactions (43,757 records) for a period ranging from 1848 to 1919[15]. For the vast majority of artwork, the name of the artist, the title of the work as well as the date and price of acquisition are available. In some instances, the size of the artwork is mentioned. In many instances, the names of the buyers were recorded and when the artwork was sold, the date and price of the sale are usually provided.

Before 1860, Goupil & Cie still focused mostly on prints as reflected in the complete company name ("Goupil & Cie. Commerce d'estampes, achat, vente edition", Penot, 2017). In 1860, the company name changed into "Goupil & Cie. Commerce de tableaux et de dessins, edition d'estampes" to reflect the importance of the paintings dealing part of its business. In line with this change, the number of artworks reported in the books dramatically rose after 1860. Therefore, the analysis is conducted on the 1860-1914 period, the latter date being chosen as to not include the First World War. The data from Goupil provides the price of acquisition of the painting, reproduction right not included[16]. In order to mitigate the impact of currency fluctuations, and in view of the limited number of artworks priced in another currency than francs, only artworks bought and sold in francs were kept in the sample. To take into account

[14] The latest cleaned-up version of the data is freely available via GitHub: https://github.com/thegetty/provenance-index-csv/tree/master/goupil

[15] Cuadra and Penot (2017) provide a more in depth description of the database.

[16] At the time reproduction rights were separated from ownership (Pénot, 2010, pp. 106-107)

changes in purchasing power, prices are deflated using the CPI provided in Lévy-Leboyer and Bourguignon (1985). Prices are thus expressed in French francs from 1860.

Table 1 describes the sample in detail. The original dataset (1848-1919) contains 43,757 entries. We never use this sample in our regressions since our focus is on the period 1860-1914. From the original dataset, we subtract exchanged artworks, artworks sold to branches[17], artworks given to third parties, cancelled sales and artworks without acquisition price and artworks for which the sale date is unspecified. We also exclude artworks that are not works on paper or paintings. Once these are taken out of the sample, our sample includes 35,354 artworks. This is the sample used to compute the mean mark-up for the whole sample. To analyze mark-ups in function of time spent in inventory, we subtract from this sample unsold artworks. Unless otherwise specified, the figures reported refer to this sample, also used for the other regressions, and which contains 25,632 artworks ('Main Working Sample').

Insert Table 1 here

Goupil's books contain also information regarding the artists, the artworks or the sales. Based on this information we create the set of variables listed below.

- **Artist characteristics**

Artist dummies: this variable takes the value one for each artist, who has realized the painting. Over the period of study, Goupil sold artworks made by 1881 different artists.

Artist in residence dummy: this variable takes the value one if the artist was in residence at Goupil. This information is only available for the period 1860–1884; for

[17] Taking into account artworks sold to branches would actually mean analyzing transfer prices.

the list of artist in residence, see Penot, 2017. Over this period, artists in residence created 4,495 of the works present in our database.

- **Inventory characteristics**

Days in inventory: this continuous variable accounts for the number of days between the date of entry of the artwork in Goupil's inventory and the date of sale.

Size of the inventory: this variable reflects the number of artworks from a given artist in Goupil's inventory at the beginning of each year. The mean number of artwork held in inventory was slightly below 5 with a median of 3. In a few rare instances, the figure is negative signaling the Goupil had committed to deliver artworks he had not in inventory yet.

- **Buyers' characteristics**

All transactions mention either the buyer's name (and often, location, address) and title or whether it was an anonymous transaction. Over the 25,632 transactions, before cleaning and identification of the buyers, the dataset shows 8,095 distinct buyers (i.e. different spelling for the same person). We were able, for 14,207 transactions, to identify the buyer and track him back to its identity. In 2,100 occurrences, the sales were anonymous. For the remainder of the dataset, we cleaned the spelling of the names but were unable to link them with known buyers (either because there was too little information, or because of issues regarding homonyms[18].

[18] For example 'Dumont' is the name of a buyer that occurs once in the dataset and is thus hard to identify

- **Art dealers**: takes the value one if the buyer is an art dealer or gallery owner; on average, transactions with art dealers represented 42.30% of the transactions at Goupil's (the dummy takes the value 1 in 10,842 occurrences).
- Most important art dealers : this sub-specification of the variable 'Art Dealers' decomposes the dummy Art Dealers into the most important art dealers in terms of number of artworks bought at Goupil, i.e. the art dealers for which more than a 100 transactions are identified in the Main Working Sample.
- **Nobles:** takes the value one if the buyer is a member of aristocracy; on average nobles bought 3.55% of the transactions in the dataset (the dummy takes the value 1 in 880 occurrences).
- **Fidelity:** represents the number of artworks bought by the buyer over the whole period. The average number is high reflecting the presence of some very large buyers (mostly art dealers). The median number is equal to one, reflecting the important number of clients coming unregularly.

Insert Table 2 here

Table 2 provides descriptive statistics for all the variables but for the dummies. Before detailing our methodology, the next sections provide a view of the database. We first provide figures regarding the number of artworks sold and the amounts they sold for. We then discuss the nature of the artworks sold, by analyzing the nationality of the artists and the artistic movements these artists belonged to. We then turn to inventory characteristics: number of days in inventory and size of the inventory. Eventually, we present the main buyers in our sample.

Insert Figure 1 here

Figure 1 displays the number of artworks sold per year as well as the real revenues obtained for the sales. As mentioned earlier the bulk of the activity is concentrated between 1860 and 1914. After a relatively slow start, Goupil expanded its business dramatically and already in 1865, Goupil recorded the sale of more than 400 artworks. During peak years, sales of more than a thousand artworks a year occurred.

In view of the important international network developed by Goupil over the years, one may wonder to which extent expansion led to changes in the art dealer's selection of artists. Table 3 reports the proportion of each nationality with respect to the number of artworks sold at Goupil's.

Insert Table 3 here

Nowadays artists are often linked to artistic schools. During the 19th century however, it was common for art dealers to specialize in artists coming from a given country (Fletcher and Helmreich, 2012; Baetens, 2014; Robins, 2014). Charles Sedelmeyer, for example, represented artists from the Austro-Hungarian Empire in Paris during the 1870s and 1880s – some of them taken away from Goupil (Huemer, 2004). In London, many galleries were actually named after the country they were specializing in[19]. Several galleries could, in parallel, specialize in artworks produced in the same country. This was the case for France with actors such as Agnew, McLean, Wallis and Gambart (from the French Gallery). The artists most represented in the sample are French and Dutch. They represent respectively 72% and 15% in terms of sales, followed by Italian (3%) and British painters (2%). This proportion varies however, and Dutch artists gain more and more importance after 1880. By 1900, French and Dutch artists represented together close to 90% of artists' nationalities. Thus, whereas at the beginning of the sample, artists from other countries (Belgium, Germany, Italy, Spain etc…) accounted for more or less a third of the nationalities, Goupil gradually specialized in French and Dutch artists. The increase in the number

[19] The German Gallery, the Dutch Gallery, the French Gallery or the Japanese Gallery for example.

of British painters may be linked to the strategies developed by David Croal Thompson who was in charge of the British branch of Goupil (Helmreich, 2011).

To give a sense of the styles of artworks exhibited, we matched artists with artistic movements. A note of caution is however warranted. First, for many artists it is impossible to clearly identify an artistic movement[20]. Second, some artists may be linked to several movements. Last and certainly not least, art historians may disagree as to whether an artist should be included in one movement or another. Our exercise is therefore tentative and aims mostly at providing an indication of the artists being sold by Goupil.

Insert Table 4 here

Table 4 lists the name of the 20 artists with the highest number of artwork sold, with the highest sales (sum of sale prices per artist) and with the highest average price. A first striking point is that the dichotomy between art galleries specializing in Old Masters and the ones representing contemporaneous artists was not strict[21]. Even though contemporaneous artists account for the bulk of artworks sold by Goupil, Old Masters were also regularly offered for sale. Within this group, masters from the Dutch Golden Age (Frans Hals, Pieter de Hooch, and Rembrandt for example) were probably the most represented, followed by French masters from the 18th century. The books also mention works by other international masters such as Canaletto, Dürer, El Greco, Guardi, the Titian, Tintoretto, Velasquez and Veronese to name but a few. Paintings by Old Masters reached the highest average prices (Table 4). But the vast majority of artworks was from the 19th century. The Barbizon school was in numbers the most

[20] This is obviously the case for artists who have not survived the test of time.
[21] Stolwijck (1998, p. 197) mentions a similar pattern for some Dutch art dealers at the end of the 19th century.

represented. Table 4 shows the importance of painters such as Jean-Baptiste Camille Corot, Narcisse Diaz de la Pena, Charles François Daubigny, Felix Ziem, and Charles-Emile Jacque but also painters inspired by the Barbizon school such as Emile Van Marcke. These six painters alone account for more than 2,600 artworks from the database. The Hague school was also important, as shown by the number of works by Jacob Hendricus Maris, Anton Mauve and Jozef Israels, which, added together, represent 1,509 paintings. This was the result of the opening of a branch in The Hague, which prompted Goupil to sponsor Dutch artists, both in The Netherlands and internationally (Stolwijk, 1998, p.190). Most artistic movements of the 19th century are represented in Goupil's books. As expected, paintings by academic, romantic, realist and naturalist painters are frequent. Orientalist painters are also well represented. But several avant-garde movements are also encountered. Goupil sold paintings by Cézanne, Gauguin, Manet, Monet, Pissarro, and Toulouse-Lautrec. Symbolist painters such as Odilon Redon, but also Pre-Raphaelite painters (Rossetti for example) could be found next to painters from the Hudson School. In short, Goupil specialized mostly in non-avant-garde 19th century painters but regularly sold less canonical artists or even Old Masters.

Sales of artworks is by nature a risky business as tastes change and the ability to sell a given artwork may quickly be altered. Over the sample period, Goupil sold 73,51% of artworks (26,983[22] out of 36,705). This is close to what Ashenfelter and Graddy (2003) report nowadays in a typical auction: between 71% and 79% of paintings offered at auction find a buyer.

[22] This number is computed on the basis of the amount of sold artworks generally used (25,632) to with 1,351 sales, that we took out of the sample because the sale date was not mentioned even though they were listed as sold, are added. See Table 1.

Insert Table 5 here

Table 5 details the number of artworks sold and the date of sale compared to the date of acquisition. In many instances, Goupil had a buyer before he purchased the artwork, in a few instances more than a year in advance. For 6.41% of sold artworks, the sale was registered before the acquisition of the artwork. Registering a sale before an artwork was actually acquired seems odd at first sight. We understand that this practice reflected either the sale of commissioned works or the sale of works, which the dealer knew some of his clients, were seeking. This practice was still common in the interwar period (Fage, 1930, p. 105). For the artworks eventually sold, 31.6% were sold within a month following the acquisition, with an additional 8.6% the month after. If artworks were to be sold, they had, in more than 50% of cases, found a buyer within three months of acquisition and in 74.1%of cases within a year after acquisition. The median number of days in inventory, 78 days, also reflects a high speed of sale. The likelihood to be sold declined strongly after two years. This observation is in stark contrast with the strategy of Paul Durand-Ruel. Zarobell (2014, p. 70) reports that out of the 29 paintings by Manet present in his stock books from 1872 to 1876, only four were sold before 1876. In general, Durand-Ruel was buying artworks fast, without being sure to resell these and as a result his inventory kept on growing (Zarobell, 2014, p. 74). Comparing both inventories, the art critic Emil Heilbut mentioned in 1889 that Durand-Ruel's inventory was richer in paintings than Goupil's (Hansen, 2014).

Insert Figure 2 here

For the sold artworks, Figure 2 shows the average and median distribution of the number of days in inventory (difference in days between sale date and acquisition date). The median number of days in inventory is remarkably low for artworks sold (78 days). The average figure is much higher reflecting the importance of some outliers. Except for the very early period and the last year, the median number of days in inventory is below 200 days. From 1866 to 1890, it remains below 100 days. In the following period the median rises. This difference may be attributed to difference in strategies between Goupil and its successors. Whereas Goupil focused on well-established artists, Boussod and Valadon were ready to take more risks and buy artworks from some of the impressionists such as Pissarro or Monet (Galenson and Jensen, 2002). The change in the median number of days in inventory might reflect a change in riskiness. Indeed, it is reasonable to assume that the ability to sell quickly artworks from mainstream artists was higher than for avant-garde ones.

Insert Figure 3 here

To set the frequency of sales into perspective, we compute the size of the inventory of artworks held by Goupil and its successors. As is standard in accounting, the inventory is measured at acquisition price[23]. Since each artwork is unique, we use the standard specific identification technique to compute the end of year value of the inventory: we add artworks to the inventory at acquisition price and withdraw them using the acquisition price when sold. Figure 3 details the evolution of the end of year inventory. Quite logically, as Goupil's business expanded its inventory expanded as well, moving from a trivial figure in 1860 to figures in the millions of francs less than a decade later. For the whole period, the inventory had an average value of more than 2,100,000 FF. The evolution of this value reflects changes in Goupil's business environment. In a first phase, the inventory experienced a dramatic increase up until 1880 at which date it began a downward movement resulting in a low of 1.35 million FF in 1887. The inventory experienced an upward trend afterwards culminating at more than 4.4 million FF in 1893. As a whole, inventory figures provide an estimate of the financing needs of

[23] Inventory values are therefore, and as is standard in accounting expressed in nominal terms. We adopted this standard approach to allow comparing our results of inventory turnover with figures from today.

the company. Keeping a large inventory is indeed costly and it may endanger the liquidity position of any business.

The books also provide information on the identity of the buyers. The number of artworks bought by art dealers is striking. As a group, art dealers represented indeed the main buyers; buying 42.74% of artworks eventually sold by Goupil. Their importance reflects the change in the nature of art dealing which took place at the end of the 19th century. Gradually, art dealers took a more and more important place in the art market (Stolwijk, 1998; Bayer and Page, 2016)[24]. There are few comparison points regarding dealers' inventories or sale patterns. Bayer and Page (2016) report however that for the Victorian art dealer Arthur Tooths & Sons during the year 1870/1871, art dealers bought around 75% of the works sold by the company. Even though the figures only represent two years of sale, they are consistent with our observation that art dealers were important buyers. Even nowadays, according to Cooper (1985, p. 38) "most dealers do most of their selling to other dealers" with narrow specialists being however more inclined to sell directly to private buyers. This "insider" dealing would also help to solve cash-flow problems by prompting dealers to sell to more specialized dealers Cooper (1985, pp. 45-46).

Insert Table 6 here

Table 6 provides a list of the twenty dealers who were the most frequently buying from Goupil. A comprehensive history of art dealers during the 19th century still needs to be written. It is nonetheless possible to identify most of the dealers. The list of art dealers reflect the truly international nature of Goupil's business. Knoedler has a special

[24] In parallel art dealers gradually became important buyers at auctions. In the UK, they represented only a fraction of buyers in 1860, but they were buying more than 50% of the paintings put at auction by 1900 (Bayer and Page, 2016). This was also the case in France. Gee (1981, p. 33) mentions that between 1920 and 1930, 80% of buyers having acquired more than ten artworks were dealers.

place in the group of art dealers because up until 1857, it was a branch of Goupil. William Schaus and Company is in a somewhat similar position since William Schaus was a former employee of Goupil (Goldstein, 2000). The presence of the British art dealers Wallis and Mac Lean is not surprising as both specialized in French art and were also regularly interacting with Paul Durand-Ruel (Robins, 2014, p. 135). They also belong to the database created by Algernon Graves and were thus active on the British auction market as well (Bayer and Page, 2016). The other art dealers include French dealers but also foreign ones (American, Belgian, British and Dutch). The third American dealer, Charles F. Haseltine, was the brother of the painter William Stanley Haseltine and was active in Philadelphia (Simpson, 2011). Some of the most active British dealers such as Agnew, Colnaghi and Vokins do not belong to the list of most important buyers. This might reflect their specialization in Old Masters paintings. By contrast, more minor actors, such as Forbes. J. Staats, Everard & Co and Thomas Richardson were regular buyers at Goupil. The same holds for French art dealers. Important dealers such as Georges Petit or Bernheim Jeune were regular buyers alongside lesser-known ones such as Bague and Cie, whereas other important dealers seem to have relied only occasionally on Goupil to buy artworks.

The ledgers also allow identifying members of the aristocracy. They bought on average 3.43% of artworks. Among this group one may find prestigious figures such as *Sa Majesté le Roi de Wurtemberg, Le Prince de Saxe Cobourg, or Sa Majesté la Reine d'Angleterre*. Some members of the nobility also had internationally renowned collection. This was for example the case of the Dutch Baron Adolf Hendrick Steengracht van Duivenvoorde. The origins of his collection, mainly focused on artists from the Dutch Golden Age, could be traced back to the 17th century (Petit, 1913).

Famous collectors are also regularly encountered outside nobility[25]. Important bankers and investors, or their spouses, such as for example the wives of Albert and Nathaniel Rothschild were clients. The French industrialist and collector Pierre Eugène Secrétan was a client from Goupil. Secrétan is famous on several grounds. Financial historians know him mostly for his failed scheme to corner the market for copper which led the Banque de France to support the Comptoir d'Escompte in 1889 (Hautcoeur et al. 2014). Secrétan is however probably more known for the sale of his collections which stemmed from his business failure. The sale included l'*Angélus* from Jean-François Millet and led to heated debates. Part of the French art world wanted to guarantee that the masterpiece would remain in France. Eventually, the artwork was sold to the American Art Association but brought back in France in November 1890 when Alfred Chauchard bought it and eventually bequeath it to the Louvre (Saint-Raymond, 2018). As was the case for art dealers, the geographic origins of the collectors is a testimony to the international orientation of Goupil[26]. José Prudencio de Guerrico and Lorenzo Pellerano, two of the main Argentinean collectors at the turn of the century bought most of their artworks from Boussod, Valadon and Cie (Baldassare, 2017).

III. Methodology

We rely on a series of indicators to analyze Goupil's inventory strategy. First, we compute the stock turnover. Stock turnover is a standard measure to gauge the effectiveness of inventory management (Wild, 2002, p. 46). In line with the literature,

[25] A full list and analysis of all collectors would go beyond the scope of this paper, we therefore focus on just a few examples but one may additionally mention, for example, René Descamps-Scrive, Victoire Antoine Desfossés, and Ernest Hoschédé.

[26] One may also mention for example Alexander Constantine Ionides (UK) and William Thompson Walters (USA).

the stock turnover is defined as the value of annual sales divided by the value of the stock.

In a second phase, we compute the mark-ups made on each painting sold. π_i the mark-up of item i is defined as: $\pi_i = \frac{P_{is} - P_{ib}}{P_{ib}}$ $where\ P_{is}$ and P_{ib} are the sale and acquisition prices paid by Goupil for the artwork *i*,. We provide the results for the artworks which sold. In order to also take into account the works that never sold, we also compute an overall mark-up, and in the absence of any information regarding the fate of these works, we take a very conservative approach and assume that they were valueless when Goupil closed its doors in 1919. We then look at the distribution of the mark-ups in function of the number of days artworks spend in inventory. We report both mark-ups and mean daily mark-ups defined as average mark-ups divided by the number of days in inventory[27]. The expectation is that the longer an artwork remains in inventory, the lower the mark-up.

To more formally assess the role of inventory in the mark-ups we run an OLS regression with as dependent variable the mark-up. For this analysis the sample is restricted to the artworks which were actually sold. Regressions include control variables related to the artists, the inventory, the buyers and years' fixed-effects[28]. Inventory variables are included with their squared values to potentially capture non-linear effects.

The estimated equation is:

$$\ln(1+\pi_{it}) = c + \sum_{m=1}^{M} \alpha_m A_{mi} + \sum_{k=1}^{K} \beta_i\, B_{kit} + \sum_{t=0}^{T} \theta_t T_{it} + \gamma_i G_{it} + \delta_i G_{it}^2 + \tau_i S_{ait} + \varphi_i S_{ait}^2 + \varepsilon_i$$

[27] For commissioned works, we consider by convention one day in inventory.

[28] Lack of data unfortunately prevents adding other control variables.

where respectively c is a constant, A_{mi} denotes the m-th *characteristic* of the artist who created *item i*, B_{kit} is k-th characteristic of the buyer of item i sold on year t, T_{it} is a dummy variable taking the value of 1 if item i is sold on year t, G_{it} is the number of days spent in inventory of item *i*, sold on year t, S_{ati} is the size of the inventory at the beginning of the year of sale t for artist A who created artwork i, and ε_i is the error term. Coefficients γ, δ, τ and φ are of particular interest for the analysis of the inventory. We expect coefficients related to the number of days in inventory to be negative, signalling that artworks which could not be sold fast were more likely to be sold at lower mark-up. We are agnostic regarding the sign of the coefficients for the size of the inventory. A positive coefficient would mean that Goupil required a larger mark-up for artists largely represented in his inventory. This would denote a strategy *à la Durand-Ruel*, the fourth strategy mentioned in the introduction. By contrast a negative coefficient would signal a willingness to minimize the number of artworks held in inventory, and this at the artist level, a strategy closer to strategy three. Artists in residence allow also analysing Goupil's inventory management. Since we only have information regarding these artists for a restricted period, they are included in a separate regression. Interestingly, despite their specific tie to Goupil, their works were as likely as works from other painters to be sold by commission.

Lastly we analyze in detail the determinants for Goupil to sell artworks at a loss by running a probit regression with as dependent variable the sold at a loss dummy, y_i. In our binary probit model, to be sold at a loss was taken as 1, while to be sold at a premium or no gain but no loss was taken as 0. The loss variable y_i, is an indicator variable that takes the following form:

$$y_i \begin{cases} 1 \; if \; y_i^* < 0 \\ 0 \; if \; y_i^* \geq 0 \end{cases}$$

Where y_i^* is the latent variable that is equal to $P_{is} - P_{ib}$, the sale price P_{is} minus the acquisition price P_{ib}.

The latent distribution variable is modelled as:

$$y_{it}^* = c + \sum_{m=1}^{M} \alpha_m A_{mi} + \sum_{k=1}^{K} \beta_i \, B_{kit} + \gamma_i G_{it} + \tau_i S_{ait} + \varepsilon_i$$

Where y_{it}^* is a latent variable that measures the loss. c is a constant, A_{mi} denotes the m-th *characteristic* of the artist who created *item i*, G_{it} is the number of days spent in inventory of *item i*, B_{kit} is k-th characteristic of the buyer of item *i*, S_{ait} is the size of the inventory at the beginning of the year *t* A who created artwork *i*, and ε_i is the error term

The probit model takes the following form:

$$\Pr(y_i = 1 \mid x_i) = \Phi \left(x_i{}' \rho \right)$$

Where Φ is the Cumulative Distribution Function of the standard normal distribution, is the probability to be sold at a loss for the artwork *i*, x_i is the vector of regressors A_{mi}, G_i and B_{ki} and ϱ is the vector of estimated coefficients, α_m, γ_i, β_i and τ_i.

IV. Results and Discussion

This section provides and discusses the results of our analysis. We first report our stock turnover figures, then the mark-up analysis. The descriptive statistics for both variables are presented in Table 6.

Insert Table 6 here

Stock Turnover

Insert Figure 4 here

Figure 4 tracks the evolution of stock turnover over time. Inventory turnover provides an indication on how many times during a given year a company manages to sell a quantity of goods equal to its average inventory. By construction, values of stock turnover equal to one reflect a situation when on a given year the firm sells the equivalent of its inventory. Unsurprisingly stock turnover is highly influenced by the activity. There is, to the best of our knowledge, no analysis regarding art dealers' turnover. It is however possible to set Goupil's figures into perspective by looking at other firms active in the luxury sector. Indeed, as pointed out by Williams et al, (2012, p. 648) "Companies that sell high mark-up items, such as jewelry stores and art galleries, can operate successfully with much lower inventory turnover rates". Gaur et al. (2005) compare stock turnover for a series of industries. Their analysis, based on 311 listed firms, reports an average turnover of 6.08. This is substantially larger than Goupil's average stock turnover of 1.14. But for Goupil's closest sector in their analysis, jewelry stores, stock turnover is on average 1.68. This figure is perfectly in line with our results for Goupil. The same holds for standard deviation. Goupil's figure 0.64 is indeed very close to the value of 0.52 reported by Gaur et al. (2005) for jewelry stores.

In most years Goupil's inventory turnover remained within a range of 0.5 and 1.5. In 1867, stock turnover spiked. Turnover figures reflect the volatility of the business with periods of high turnover alternating with periods of very low turnover. Changes in stock turnover show that Goupil experienced periods of extreme stress during two periods: in 1874-1879 and after 1903. The first drop may be linked to the 1873 crisis (Penot, 2017). Bouillon (1986) stresses the importance of this financial crisis on the Parisian art market. Many art dealers indeed had trouble at the same time. For example, Durand-Ruel mentions a difficult period starting in 1873 and ending in 1888 (Fénéon, 1920; Bouillon, 1986). Sales indeed declined in 1874. It took then more than six years to come back to at a value close to the one observed at beginning of the crisis (see Figure 1). Turnover figures indicate that the company experienced a real shock when the crises occurred and was unable to convert into sales the new acquisitions it had made in 1873. De Maupéou and Saint-Raymond (2013) indicate that the crisis of 1873 was reflected in the number of art dealers only in 1876, when it experienced a sharp decline. The low turnover observed at the end of the period may explain the eventual disappearance of Goupil at the beginning of the 20th century. On the other hand, for some years the turnover was so high that on average the value of the inventory was sold up to four times within a year. Comparison points are unfortunately limited as archives form other dealers have almost never been analyzed. For the years 1870-1871, Bayer and Page (2016, p. 114 and 117) mention nonetheless that the Victorian art dealer Arthur Tooth & Sons was continuously refreshing his inventory, suggesting that the observation made in the case of Goupil may in fact reflect a more general pattern.

Mark-ups analysis

Table 7 provides the mark-up values. We report both mark-ups and mean daily mark-ups defined as average mark-ups divided by the number of days in inventory. This second measure provides a better sense of the impact of speed of sales on profits. The table also reports the percentage of artworks sold within a time frame as well as the cumulative percentage.

Insert Table 7 here

For the whole period, and if one considers unsold artworks, mark-ups were on average equal to 16.77%. This is smaller than the observation made by Stolwijk (1998, p. 110), who mentions average mark-ups of 32% for artworks purchased directly from the artists for the Dutch branch of Goupil[29]. The difference is in all likelihood due to the inclusion of the unsold artworks. Once unsold artworks are excluded from the sample, the figure becomes much higher with a median mark-up of 38%. On average, Goupil sold artworks for a price 61.05% higher than the acquisition price. This figure hides an important disparity as mark-ups were affected by the ability to sell the works quickly or not. For commissioned works (or works the dealer knew were sought after by his clients) the mark-up was on average lower (58.63%) reflecting the fact that such sales had a positive impact on the firm's liquidity since the proceeds of the sales were received before the acquisition of the artwork. This is substantially higher than the figure ranging between 10% and 30% mentioned by Stolwijk (1998, p. 210) for the Dutch branch of Goupil between 1861 and 1900. This difference may reflect cultural specificities. Indeed, according to Stolwijk (1998, p. 210), at the time in The Netherlands, only the low end of the market worked in this fashion and more prestigious houses only used commissions in times of recession. In this case it is not surprising that mark-ups for such sales would be smaller in The Netherlands since these sales would mostly happen during recessions. In general Goupil's mark-ups tend to follow an inverted U-shape pattern. They rise in the first months but already decline for artworks sold after two months. If sales are made so fast, it seems logical to require a relatively low mark up. Nowadays, Cooper (1985, p. 42) asserts indeed that dealers should not be too greedy when a speedy turnover is feasible. During the first two years mark-ups decline gradually as time in inventory increases. After two years in inventory however, it seems Goupil was ready to let artworks go for a much smaller mark-up. This evidence suggest that Goupil indeed attached great importance to the speed of sales[30]. When considering the daily mark-up, the fastest sales prove to be the most

[29] The sample comprises more than 1,000 artworks from 41 different artists.
[30] This result is also in line with the correspondence mentioned by Helmreich (2011, p. 80) for the London branch "quick turnover, accompanied by a high volume of sales generated from prints, books and photographs, was the formula dictated by the Paris house".

interesting, i.e. the orders were the most profitable in terms of daily mark-ups or daily returns. Speed of sale is still important nowadays. According to Cooper (1985, p.73) "They [the antique dealers] would, by and large, be happy to take £3,000 for a set of chairs within a week of purchasing them, even if certain unusual features might suggest that £4,000 could be secured if they waited a bit."

Speed of sale was thus crucial for Goupil and contrasts with the position of Durand-Ruel who supported his artists on the long run, even at cost of a large inventory. Durand-Ruel made thus a real bet, a bet that he eventually won, but at a high risk since he faced bankruptcy several times. There is a marked difference between these two extreme cases. For artworks sold after two months a smaller mark-up is not an issue as the speed of the sale has a positive impact on liquidity. For artworks sold after two years the lower mark-up reflects in all likelihood a failure to sell at the expected price and the need to lower expectations to be able to sell. This is consistent with the observation reported by Bayer and Page (2016) who document that dealers' sales through auctions were more likely to end up being bought-in. Dealers who were unable to sell the works in their shops could thus hardly rely on auctions to secure a profit.

Mark-up determinants

Goupil could decide to lower his mark-up to manage his inventory. To assess whether this was the case, we regress the logarithm of the mark-up on the size of the inventory (and its squared value), the number of days in inventory (and its squared value) while controlling for artists and buyers' characteristics. We include yearly time fixed effects to take into account the state of the business environment. This forms our baseline specification. In another specification, the "extended art dealers model", we include specific dummy variables for each of the main art dealers. This allows analyzing whether our results are robust to potential differences in relationship with Goupil across art dealers. Eventually, we run the regressions on the whole period and on a sub-period for which data about artists in residence is available. Results are reported in Table 8.

Insert Table 8 here

Many of our variables explain part of the mark-up. Our main variables of interest, the number of days in inventory, the size of inventory, and the artist in residence dummy are statistically significant at the conventional level of confidence.

The coefficient for the time in inventory is negative, but positive for the square value[31] (albeit with a coefficient an order of magnitude smaller). To get a sense of the overall effect of this observation, we simulate the change in mark-up for several length of stay in inventory[32]. Artworks held in inventory during six months (180 days), a year (360 days) and two years (720 days) had a reduction in mark-up equal respectively to 5.07%, to 9.77% and 18.13%. Another way to gauge the effect is to look at the impact for the median and the mean numbers of days in inventory. The decline in mark-up is then of 2.24% (median of 78 days) and 10.69% (mean of 397 days). The regression thus confirms that the longer it took to realize a sale, the lower the mark-up. In other words, artworks, which remained longer in the inventory, sold at a discount. These results are robust to a change in specification for the art dealer variable (even though slightly

[31] It is also negative for the sub-period with the artist in residence.

[32] Since the specification is based on ln $(1+\pi)$ we take the exponential of the coefficients time the number of days. We provide here the end result, that is, once both the days in inventory and its squared value are considered.

lower). Ashenfelter and Graddy (2003) as well as Beggs and Graddy (2008) show that failure to sell at auction leads to subsequent lower prices when the artworks come back on the market. Beggs and Graddy (2008) find a reduction in return of about 30% for "burned" artworks and this controlling for holding periods. For galleries, it seems that failure to sell quickly also induced the seller to accept a slightly lower mark-up.

The size of the inventory, and its square value, are always significant. There again the signs are opposite, the coefficients have also an order of magnitude in difference. The overall effect shows that larger inventories were in fact associated with higher mark-ups. The size of the effect is however relatively limited. For the mean number of artworks (4.85), the increase is equal to 3.32%, for the median number (1) it is only 0.74%. Even though the economic impact is somehow limited, results still tend to indicate that Goupil protected the value of artists for which he had large inventories by requiring a higher mark-up. These results are robust to a change in specification for the art dealer variable (even though slightly higher). One should note however that Goupil adopted only part of the strategy used by Paul Durand-Ruel to defend his artists. Paul Durand-Ruel asked for high prices for the artists he represented[33] and was also willing to defend their value at auction. He would push, whenever possible, the prices at auction for artworks from the artists he supported (Distel, 1990; Durand-Ruel and Durand-Ruel, 2014, pp. 57, 59, 75). Durand-Ruel went as far as saying that the public was judging the talent and the merits of artists by their success at auction (Durand-Ruel

[33] In a letter to the collector Erdwin Amsinck, Emil Heilbut, wrote "I've always found Durand-Ruel expensive, even in other fields. But he is always very well informed about the value of his paintings and does not give them away, as long as they are good, at a low price - unlike Goupil, who relies more on the purchase price and who, once he has made a cheap acquisition, sells it quite cheaply." ()"J'ai toujours trouvé Durand-Ruel cher, même dans d'autres domaines. Mais il est toujours très bien informé de la valeur de ses tableaux et ne s'en défait pas, dès lors qu'ils sont bons, à prix bas - contrairement à Goupil, qui s'appuie davantage sur le prix d'achat et qui, dès qu'il a fait une acquisition à prix bas, la revend assez bon marché". Cited in Hansen (2014, p.121)

and Durand-Ruel, 2014, p. 59). Doing so had another benefit; it increased the value of the inventory (Durand-Ruel and Durand-Ruel, 2014, pp. 103, 105). By contrast, Goupil seems to have been only marginally involved as buyer during the auctions held at Drouot. Saint-Raymond (2018) lists indeed the amount spend at auction for the year 1875. Durand-Ruel spent the most on that given year, followed closely by collectors but also other art dealers such as Francis Petit, Eugène Féral, Charles Sedelmeyer and Hollender. Goupil was far behind with figures a fraction of those of Durand-Ruel.

The artist in residence dummy shows that, on average, mark-ups for artworks made by artists in residence were statistically lower than for other artists (-42%). First, this observation may reflect a problem of over-supply. The continuous stream of artworks from given artists naturally increased the inventory of artworks of these artists, an element which may have prompted Goupil to agree to part with some of the works on less favourable terms. The size of the inventory of artworks from artists in residence began to grow considerably after 1874 and remained extremely high up until 1900. This does not mean that it grew for all artists in residence. In fact for some the inventory declined fast, but on average this is observable pattern. In the Netherlands, this was an issue directly mentioned by the Van Wisselingh & Co. The firm decided to stop buying all the production from Willem Witsen because the stock of his work had reached a value of 35,000 guilders (Heijbroek and Wouthuysen, 1999, p. 117). Second, and most importantly, Goupil may have been willing to accept a lower mark-up in order to launch the market for these artists. In this case, the lower mark-up would have been a strategy aiming at increasing the reputation and developing a market for these artists[34]. It is also consistent with the way the market was functioning at the time.

[34] One cannot rule out that this observation is also partly reflecting a younger age for artists in residence. Age has indeed been found as a determinant of artworks' prices (Rengers and Velthuis, 2002).

Buying artworks was relatively new for clients[35]. In order to induce them to do so, Goupil may have revised his prices downwards in order for potential clients to get used to this new practice. Third, one cannot rule out that the need to sell, even at a low mark-up, resulted from the relationship between the gallery and the artists. This is documented for the relationship between the firm Van Wisselingh & Co and the artist George Hendrik Breitner. Breitner, under contract with Van Wisselingh, had over the years incurred large debts with respect to Van Wisselingh. In order to cover these, at least partially, the artist and the firm agreed to sell directly a large number of artworks in two different private sales: one to another art dealer, the second to a regular customer (Heijbroek and Wouthuysen, 1999, p. 98). It is likely that the margins were smaller in these instances as both sales were for a large number of works.

The control variables are consistent with expectations. Fidelity bears a negative coefficient, being noble induced a higher mark-up. As for art dealers our results are more complex, showing the importance of the relationships existing between dealers.

Most accounts on the contemporaneous art market stress the importance of the relationship between gallery owners and potential buyers. Thompson (2008) relates that potential buyers are used to bargaining with the owners of art galleries. This observation is confirmed in the Goupil case. In our baseline specification fidelity was rewarded: the higher the number of artworks bought the lower the mark-up. The coefficients associated to this variables is however small. For 307 artworks (the mean fidelity value), the mark-up was reduced by just 3%. The second specification leads to

[35] Up til the mid-19th century, it was common for art dealers to lend artworks to their clients (Penot, 2010, p. 37). For artists, selling artworks was of course more profitable than having someone rent them to potential clients.

more contradictory results. This might be due to the fact that once art dealers are distinguished, there is a much stronger link between fidelity and art dealers, since the main art dealers are sorted according to their fidelity.

Our results also indicate that the nature of the buyer played an important role. In our baseline model, we find that art dealers were charged a lower mark-up. This would suggest limited competition amongst dealers. Once we focus on the largest dealers only, the results change completely. Important dealers had to pay a larger mark-up. These seemingly contradictory results may be explained by the perception of each group of dealer by Goupil. Important art dealers were viewed as competitors and there was no reason to make them a favor. It made economic sense for Goupil to extract a higher return from competitors. As artworks are unique, their owners have in fact a monopoly on each artwork they own (Baumol, 1986). This was the case for Goupil for major artists from The Hague School (Helmreich, 2011). Goupil thus seems to have exploited his monopolistic position. Competitors coming to buy an artwork were probably signaling that they had a buyer for the work. Instead of leaving their competitor the complete gains of the future sale, Goupil acted in a way, which allowed sharing the rent from the sale. In this framework, charging a higher price to a competitor would make sense. Alternatively, and as suggested by Bayer and Page (2016, p. 106), the difference might also reflect that "dealers, since they effectively dominated the market as buyers had to compete among themselves for the best works". The network analysis presented by Fletcher et al. (2012, p. 21) is also in line with this observation: "Dealers benefited from the presence of vigorous competition, which provided yet another market for their goods". De Silva et al. (2017) build on this intuition. On the basis of a unique historical dataset, they find that larger art dealers were paying on average 21% more than smaller art dealers. They attribute this striking difference to the accumulated experience and reputation of the larger dealers. By contrast Goupil treated small dealers in a preferential way. The difference of treatment may also reflect differences in specialization. This would be in line with Cooper (1985, p. 46)' assertion: "So, better than sitting out for a high price on something outside one's field and possibly not getting it for a year or more, better by far to sell it on immediately to another dealer". The main take-away of our analysis is that mark-ups could vary dramatically from one dealer to the other depending on whether they were perceived as competitors or not.

The higher mark-ups extracted from nobles may seem surprising at first sight. Indeed one could have expected that the business of noblemen would have been valued by the dealer and that in counterpart he would have agreed to lower the prices. Several explanations may be suggested. Nobles were buying artworks that are on average slightly more expensive (7,103.23 FF) than the remainder of the sample (6,174.02 FF), which might attest of a masterpiece effect. But higher mark-ups extracted from the nobles could reflect the fact that it was socially less acceptable for noblemen to discuss prices or more prosaically, that nobles were rich enough not to care too much about the prices to be paid. Eventually, if noblemen were buying artworks for conspicuous consumption, then they would have been willing to pay more as shown theoretically by Mandel's (2009) model.

Selling at a loss

Auctions are binary processes necessitating offered prices to at least meet the reserve price, i.e. the minimum price set by the seller. If the bids fail to meet the reserve price, the artwork will remain unsold. In a setting such as Goupils', one would expect prices to be much more flexible. Suppose that the art dealer knows the value of the artwork and the mark-up he can fetch, he will either be able to sell the artwork at the price he was hoping for or not. If not, he can either choose not to sell it or decide to offer it at bargain price. This selling process is thus much more flexible than the auction process. In our sample, in only 3,430 cases (out of the 25,632 sold artworks) the art dealer decided to sell at a loss. Most of these loss-generating sales were conducted on artworks which had remained in the inventory for a year or more (2,281). In 9,722 instances however, the artworks remained unsold suggesting that the art dealer preferred not selling the artworks rather than selling them at too discounted a price.

To better understand the elements leading the gallery owner to dispose of artworks at a loss, we run a probit regression. The dependent variable is the probability to be sold at a loss. Several elements may play a role when deciding to sell at a loss. Liquidity constraints could have prompted Goupil to sell at a discount. This is in line with the statements made by Paul Durand-Ruel in 1869: because of a lack of capital, he was often forced to sell fast and therefore make a more limited benefit (Durand-Ruel and Durand-Ruel, 2014, p. 68). A too high inventory for a given artist may also have led the gallery owner to revise downward its expectations.

Insert Table 9 here

Results from the probit regression (Table 9) confirm the importance of the rapidity to manage to sell. Indeed a longer duration in inventory is associated to a higher likelihood to sell the artwork for a price below the acquisition price, for the full sample and the subsample. Art dealers are also less likely, in the first specification, to have the opportunity to acquire the artwork at a loss for Goupil. This is perfectly consistent with the points made previously regarding competitors. For the subsample, art dealers' variables are not significant in the majority of cases. Larger inventories for a given artist, are, by contrast, leading to a lower likelihood to sell at a loss suggesting Goupil was defending the value of his inventory. The fact that works by artists in residence were also less likely to be sold at a loss is consistent with the inventory explanation provided earlier. As time went by, the number of works by these artists held by Goupil increased gradually. It made thus sense for Goupil to sell these artworks at a lower mark-up to reduce its stock of these works. But selling at a loss would have been counterproductive. Indeed, it would have reduced the value of its inventory and it was therefore less likely to happen.

V. Conclusion

This paper analyses art dealers' inventory strategy on the basis of data from Goupil, a major art gallery active in France at the end of the 19th century. Our paper provides several contributions. First, we propose a classification of art dealers' ways to approach inventory management. We distinguish between four main strategies: relying on commissions, on consignments, on speed of sale or on large inventories. Second, we suggest a series of indicators to assess to which extent dealers rely on a given strategy. Speed of sale and inventory turnover are used to give insights on the first and third strategies. This approach is complemented by a more formal analysis in which we test to which extent mark-ups are influenced by the time a given artwork has spent in inventory and the size of the inventory of a given artist. Eventually we analyze the relationship between inventory and the likelihood for the art dealer to sell artworks at a loss.

Goupil mostly followed the first and third strategy. Goupil relied on its ability to sell artworks quickly. On average 74% of acquisitions eventually sold. Out of the sold artworks, more than 6% represented orders: commands for a specific artwork paid in advance (either commissioned works or works specifically asked by some clients). Even if this figure might seem high, it is even nowadays quite common for gallerist to work with orders. In a recent interview by Knight (2016), Yves Bouvier, a Swiss art dealer went as far as saying that "You always have the buyer before you have the seller". In the case of Goupil, the bulk of the sold artworks was disposed of within a year. Consistent with this strategy, mark-ups were lower for artworks which had been in inventory for a long time. These artworks were also more likely to be sold at a loss.

Goupil's strategy was however complex. If speed of sale had been the main driver, he would have required lower (or at least similar) mark-ups for artists for which its inventory was large. Our results show that Goupil somehow protected the value of artists from which he had a large inventory. Large inventories are indeed associated to a slightly higher mark-up. But, in contrast to Paul Durand-Ruel, Goupil seldom bought at auction to support the artists he had in stock. Mark-up for artists in residence were lower than for other artists suggesting Goupil was ready to make a discount to establish their market but the likelihood to sell their artwork at a loss was lower, suggesting once more a preoccupation for their long term market.

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TABLES

Table 1: Dataset cleaning and various samples

Dataset	Number of observations	Cleaning reason	Number of observations deleted
Original File	**43,757**		
		Entry Date out of sample (before 1860, after 1914)	980
		Entry Date empty or unreadable	823
		Other mediums (sculptures, earthenware, …) than works on paper or paintings	177
		Entry price unreadable or no Entry price	2,092
		Transactions with branches	996
		Sale date out of sample (pre-1860, post-1914)	273
		Sale date empty (1351 occurrences) or unreadable	1,585
		Sale price unreadable or not copied	975
		Copy mistake in the dataset for one sale event, 1895	98
		Entry price = 0	153
		Given, exchanged artworks, cancelled sale, etc.	191
		Mark-up Outliers	18
		Orders with abnormal number of days (>500)	33
		2 artworks, 1 price	9
Main Working Sample	**35,354**		
		Unsold artworks	9,722
Regression Sample	**25,632**		

Table 2: Descriptive statistics of the various variables. Main Working sample

	Days in Inventory	Size	Fidelity
Mean	397.05	4.86	307.66
Median	78.00	3.00	1
Standard-deviation	769.48	6.12	676.27
Minimum	-459	-4.00	1
Maximum	8,261	54.00	2,301
Skewness	3.45	2.22	2.34
Kurtosis	19.30	10.02	6.93
Number	25,632	25,632	25,632

Table 3: Proportion of the amount of works sold according to nationality of the artist

	French	Dutch	Italian	British	Other
1860	82.35%	0.00%	0.00%	0.00%	17.65%
1880	57.94%	19.41%	6.77%	0.81%	15.07%
1900	40.68%	43.16%	2.66%	3.04%	10.46%
1913	51.87%	41.49%	1.24%	1.66%	3.73%

Table 4: Classification of artists following number of artworks sold, sales and average price

Artists	Number of artworks sold	Artists	Sum of realised sales (real terms)	Artists	Average price
COROT, JEAN BAPTISTE CAMILLE	875	COROT, JEAN BAPTISTE CAMILLE	13 697 447.96	GRECO, EL (DOMENICO THEOTOCOPULI)	279 791.89
MARIS, JACOB HENRICUS	750	DAUBIGNY, CHARLES FRANÇOIS	7 512 475.13	NATTIER, JEAN-MARC	138 452.77
MAUVE, ANTON	634	TROYON, CONSTANT	6 635 835.16	VELDE, CORNELIS VAN DE	116 035.57
DIAZ DE LA PEÑA, NARCISSE VIRGILE	620	DIAZ DE LA PEÑA, NARCISSE VIRGILE	6 055 218.15	HOBBEMA, MEINDERT	86 939.76
DAUBIGNY, CHARLES FRANÇOIS	554	GÉRÔME, JEAN LÉON	5 225 408.66	WATTEAU	70 791.76
PASINI, ALBERTO	480	ROUSSEAU, THÉODORE	4 286 255.95	PERRONEAU, JEAN-BAPTISTE	70 060.45
ZIEM, FÉLIX FRANÇOIS GEORGES PHILIBERT	470	DUPRÉ, JULES	4 237 147.60	DOMINGO Y MARQUÉS, FRANCISCO	63 872.45
MARCKE DE LUMMEN, EMILE VAN	447	MARIS, JACOB HENRICUS	4 102 560.80	LABILLE-GUIARD, ADÉLAÏDE	60 780.91
JACQUE, CHARLES EMILE	386	MARCKE DE LUMMEN, EMILE VAN	4 068 763.65	BOUCHER, FRANÇOIS	52 903.74
ISRAËLS, JOZEF	362	MEISSONIER, JEAN LOUIS ERNEST	3 670 880.74	ROUSSEAU	51 938.99
GÉRÔME, JEAN LÉON	354	BOUGUEREAU, ADOLPHE WILLIAM	3 559 284.43	POTTER, PAULUS	47 333.93
BOUGUEREAU, ADOLPHE WILLIAM	345	LHERMITTE, LÉON AUGUSTIN	3 363 404.25	CUYP, AELBERT	45 808.87
DUPRÉ, JULES	318	JACQUE, CHARLES EMILE	3 076 253.10	PIERO DELLA FRANCESCA	43 991.19
ARTZ, DAVID ADOLF CONSTANT	316	ISRAËLS, JOZEF	3 028 492.74	VIGÉE-LEBRUN, ELISABETH LOUISE	43 534.59
MARIS, WILLEM	303	MAUVE, ANTON	2 745 808.32	TIZIANO VECELLIO	42 231.67
TROYON, CONSTANT	297	ZIEM, FÉLIX FRANÇOIS GEORGES PHILIBERT	2 643 993.21	ROMNEY, GEORGE	41 943.60
BLOMMERS, BERNARDUS JOHANNES	283	DETAILLE, JEAN BAPTISTE EDOUARD	2 441 580.80	[DUTCH - 17TH C.]	41 865.51

KLINKENBERG, KAREL	280	MILLET, JEAN FRANÇOIS (1814)	2 440 498.85	GOYA Y LUCIENTES, FRANCISCO JOSÉ DE	40 266.22
LYNCH, ALBERT	263	NEUVILLE, ALPHONSE MARIE ADOLPHE DE	1 778 597.18	DYCK, ANTHONIE VAN	40 117.68
CHATTEL, FREDERIK JACOBUS VAN ROSSUM DU	260	FROMENTIN, EUGÈNE	1 460 616.45	MILLAIS, JOHN EVERETT	40 017.62

Table 5: Time in inventory and sales

Time in inventory (between)	Percentage of sold artworks	Cumulative percentage of sold artworks	Number of observations
Less than a day and zero days (commissioned works)	6.29%	6.29%	1,611
Zero days and a month	31.66%	37.95%	8,116
1-2 months	8.65%	46.59%	2,216
2-3 months	5.77%	52.36%	1,479
3-4 months	4.44%	56.81%	1,139
4-5 months	3.44%	60.25%	882
5-6 months	2.75%	63.00%	705
6-7 months	2.40%	65.40%	616
7-8 months	1.98%	67.38%	508
8-9 months	1.78%	69.17%	457
9-10 months	1.53%	70.70%	392
10-11 months	1.47%	72.17%	377
11-12 months	1.92%	74.08%	491
1 and 2 years	8.97%	83.05%	2,298
2 and 3 years	4.84%	87.89%	1,240
More than 3 years	12.11%	100.00%	3,105

Table 6: List of the twenty most important buyers (Main Working Sample)

Name of the dealers	Amount of artworks bought at Goupil's
Knoedler & Co. New York. Etats-Unis	2,298
Wallis & Sons. Londres. Grande-Bretagne.	1,192
Petit. Georges. Paris. France (7 rue Saint Georges).	425
Mac Lean. Th.. Londres. Grande-Bretagne.	372
Avery. Samuel Putman. New York. Etats-Unis	300
Forbes. J. Staats. Londres. Grande-Bretagne.	292
Arthur Tooth & Sons. Londres. Grande-Bretagne.	222
Mastenbroek. Johan. Van. Pays-Bas.	221
Schaus. William. New York. Etats-Unis.	215
Bernheim jeune & Cie Paris	204
Everard & Co. Londres. Grande-Bretagne.	202
Frans Buffa & Fils. Amsterdam. Pays-Bas.	183
Bague & Cie. Paris. France	181
Haseltine. Charles Field. Philadelphie. Etats-Unis	179
Hollender. Bruxelles. Belgique.	154
Kraushaar New York	153
Allard & Cie	146
William Marchant Co. Londres	141
E. Glaenzer & Co.	121
Montaignac. Isidore. Paris. France (9. rue Caumartin).	120

Table 6: Descriptive statistics of the turnover and the mark-up

	Turnover	Mark-up (sold artworks only)	Mark-up assuming a total loss for unsold artworks before 1919
Mean	1,09	61.05%	16.77%[36]
Median	0.82	38%	23,53%
Standard-deviation	0.64	1.5	1,46
Minimum	0.079	-99.90%	-100%
Maximum	4.31	3,403.23%	3,403.23%
Skewness	2.58	9.60	8.01
Kurtosis	10.53	133.78	112.72
Number	55	25,632	35,354

[36] Under the assumption that unsold artworks are valueless at the end of the sample.

Table 7: Time in inventory and mark-ups

Times in inventory (Between)	Mean Mark-Up	Mean-Daily Mark-Up	Number of observations
Less than a day and zero days (commissioned works)	58.78%	58.78%	1,611
Zero days and a month	59.89%	2.22%	8,116
1-2 months	92.41%	1.13%	2,216
2-3 months	83.26%	0.79%	1,479
3-4 months	81.56%	0.66%	1,139
4-5 months	87.80%	0.44%	882
5-6 months	72.57%	0.40%	705
6-7 months	77.51%	0.29%	616
7-8 months	65.69%	0.30%	508
8-9 months	77.02%	0.30%	457
9-10 months	65.53%	0.23%	392
10-11 months	72.98%	0.23%	377
11-12 months	66.25%	0.19%	491
1 and 2 years	61.36%	0.12%	2,298
2 and 3 years	43.21%	0.05%	1,240
More than 3 years	12.32%	0.01%	3,105

Table 8: Regression Results, Determinants of Mark-up, OLS Regression

All models are estimated using OLS with clustered standard errors at the artist level. The dependent variable is the natural logarithm of the mark-up ($\ln(1+\pi_i)$). ***: significant at the 1% level, **: significant at the 5% level, *: significant at the 10% level. All regressions are run using heteroskedasticity robust standard errors.

	Baseline Model	Extended art dealers model	Artists in residence
Days in inventory	-2.92×10^{-4} ***	-2.64×10^{-4} ***	-2.49×10^{-4}***
Days in inventory squared	1.58×10^{-8} ***	1.32×10^{-8} ***	-1.21×10^{-8}***
Size of the inventory	7.51×10^{-3} ***	7.62×10^{-3} ***	1.24×10^{-2}***
Size of the inventory squared	-1.67×10^{-4} ***	-1.68×10^{-4} ***	-3.00×10^{-4}***
Art Dealers	-2.76×10^{-2} ***	-	-
Knoedler		2.18×10^{2}***	3.01×10
Wallis		5.68×10^{1}***	7.38
Petit		6.34***	5.6×10^{-1}
Mac Lean		4.77***	3.64×10^{-1}
Avery		2.97***	2.27×10^{-1}
Forbes		2.76***	2.43×10^{-1}
Tooth		1.30***	4.49×10^{-2}
Mastenbroek		1.46***	8.28×10^{-2}
Schaus		1.34***	1.04×10^{-1}
Bernheim		1.11***	6.85×10^{-2}
Everard		1.15***	8.16×10^{-4}
Buffa		8.75×10^{-1}***	-1.16×10^{-1}
Bague		9.59×10^{-1}***	1.41×10^{-1}
Haseltine		5.05×10^{-1}***	-3.17×10^{-1}
Hollender		5.24×10^{-1}***	-6.53×10^{-2}
Kraushaar		5.23×10^{-1}***	Omitted
Allard & Cie		3.16×10^{-1}***	Omitted
Marchant		2.13×10^{-1}***	Omitted
Glaenzer		8.14×10^{-2}	Omitted
Montaignac		1.00×10^{-1}	Omitted
Richardson		1.91×10^{-1}***	-1.19×10^{-1}
Delmonico		1.40×10^{-1}***	-2.98×10^{-1}*
Herdtle		1.69×10^{-1}***	-5.11×10^{-2}
Nobles	7.06×10^{-2} ***	2.92×10^{-3} ***	9.43×10^{-2}***
Fidelity	-1.22×10^{-4} ***	2.92×10^{-3} ***	1.22×10^{-3}
Fidelity squared	5.47×10^{-8} ***	-4.24×10^{-5} ***	-6.23×10^{-6}
Artist in residence			-5.46×10^{-1}***

Artist fixed effect	Included	Included	Included
Year fixed effects	Included	Included	Included
Constant	-3.18	-0.25	0.803
Period	1860-1914	1860-1914	1860-1884
Observations	26,532	26,532	12,184
Number of variables	1,943	1,965	1,231
Adjusted R^2	32.17	33.49	30.68

Table 9: Regression Results, Probability to sell at a loss, Probit Model

The following tables reports the marginal effects of the variables. All models are estimated using Probit regressions. The dependent variable is the Loss dummy. The stars indicate the significance levels: * 10%, ** 5%, *** 1%.

	Extended art dealers model	Subsample 1860 - 1884
Days in inventory	6.22×10^{-4} ***	9.67×10^{-4}***
Size of the inventory	-4.88×10^{-3}**	-3.80×10^{-3}
Art Dealers		
Knoedler	-7.76 ***	4.35 *
Wallis	-4.03 ***	2.16 *
Petit	-9.35×10^{-1} ***	1.05 **
Mac Lean	-1.35 ***	2.35×10^{-1}
Avery	-1.15 ***	4.7×10^{-1}
Forbes	-1.25***	-1.62×10^{-1}
Tooth	-6.17×10^{-1} ***	Omitted
Mastenbroek	- 1.26	-1.24×10^{-1}
Schaus	- 9.69×10^{-1}***	-1.77×10^{-1}
Bernheim	-4.11×10^{-1} ***	-3.80×10^{-1}
Everard	-4.81×10^{-1} ***	5.11×10^{-1}**
Buffa	-1.13***.	Omitted
Bague	-5.23×10^{-1} ***	2.24×10^{-1}
Haseltine	2.28×10^{-1} **	1.17***
Hollender	-5.21×10^{-1} ***	1.96×10^{-1}
Kraushaar	-1.01***	Omitted
Allard & Cie	0.29**	Omitted
Marchant	Omitted	Omitted
Glaenzer	- 2.93×10^{-1}	Omitted
Montaignac	-7.56×10^{-2}	Omitted
Richardson	- 8.88×10^{-1} ***	-5.41×10^{-1}
Delmonico	-3.73×10^{-1} **	5.86×10^{-1}
Herdtle	-7.95×10^{-1} ***	-3.15×10^{-1}
Nobles	-2.93×10^{-1}***	-2.45×10^{-1}**
Fidelity	3.36×10^{-3}***	-1.93×10^{-3}***

Artist in residence	-1.63×10^{-1}***	-1.65×10^{-1}***
Artist fixed effect	Not Incl. (because of collinearity)	Not Incl. (because of collinearity)
Year fixed effects	Incl.	Incl.
Constant	-1.22	-1.67
Period	1860-1914	1860 - 1884
Observations	25,616 (16 obs. were dropped because of collinearity)	12,147
Number of variables	80	44
Pdeudo-R^2	22.03	28.06

FIGURES

Figure 1- Number of artworks sold (left axis) and sum of real realized prices (right axis – In FF of 1860)

Figure 1 displays the number of artworks sold (bars – left axis) and the sum of the realized price per year (line – right axis), which is the sum of all the sale prices over the mentioned year (Intermediary Working Dataset)

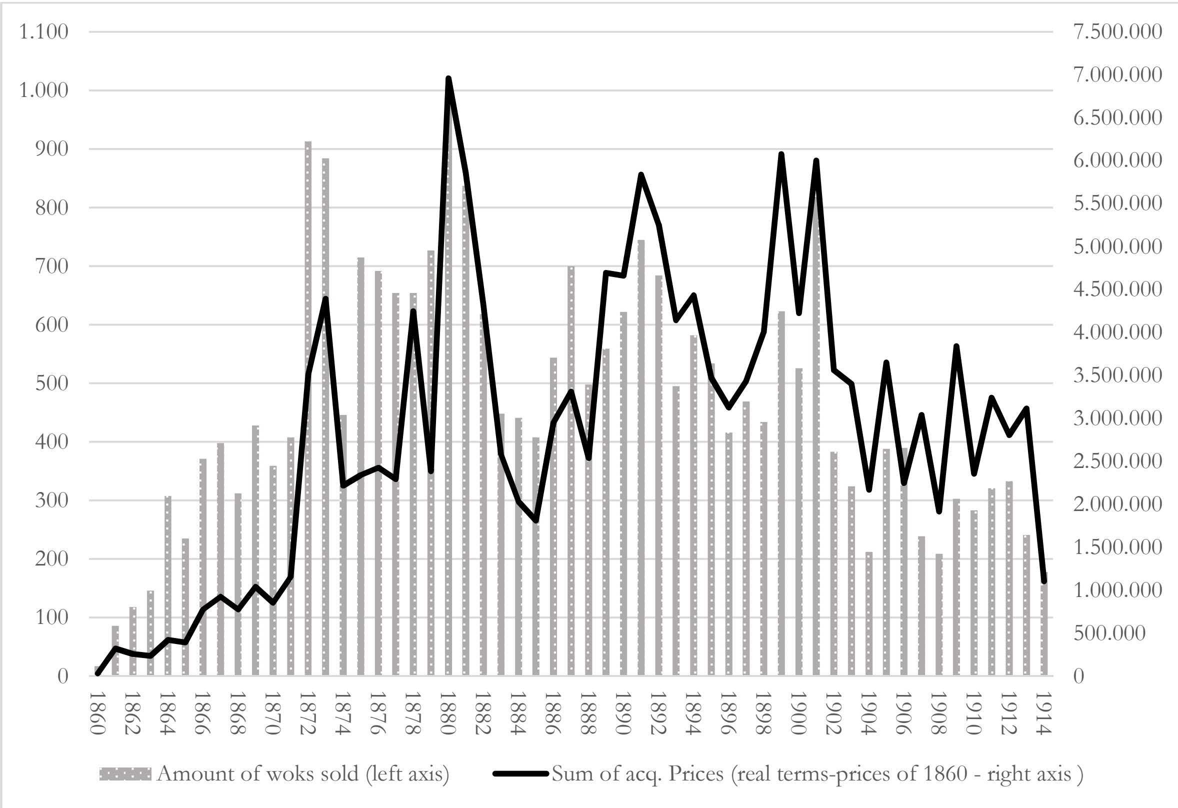

Figure 2- Average and Median number of days in inventory

The following graph displays the average and median number of days in inventory, i.e the difference in days between the sale and the acquisition date.

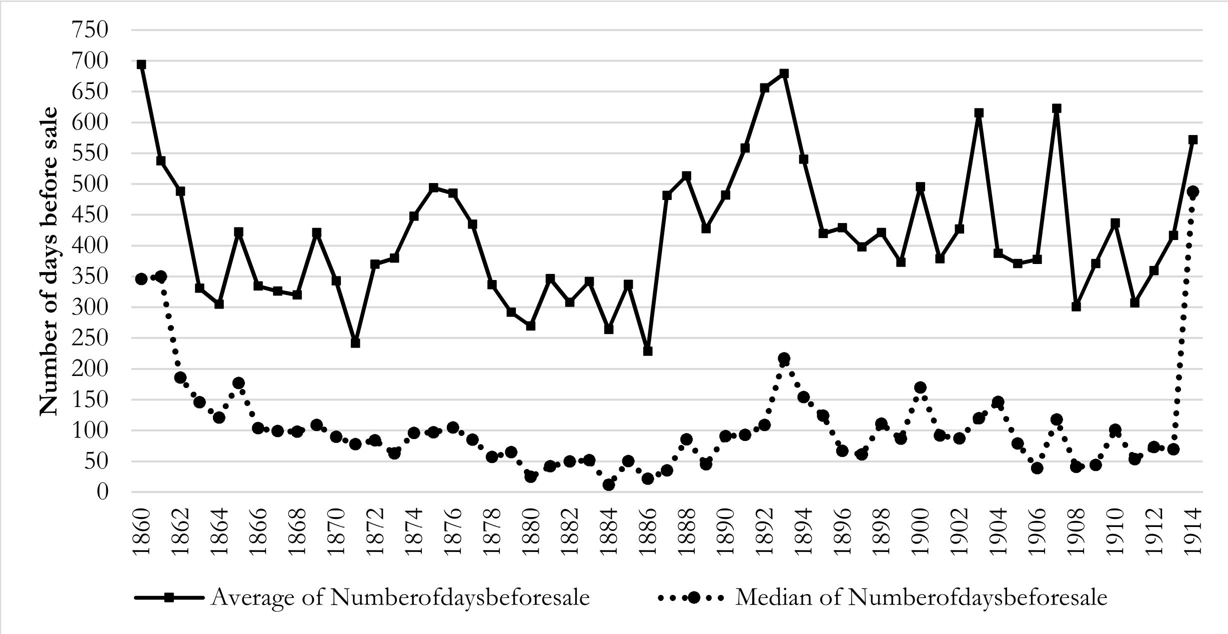

Figure 3- Inventory value in FF (nominal terms)

The next graph displays the value of the inventory in year t (reported on the left axis). The value of the inventory is the sum of the acquisition prices of the artworks in inventory at year t.

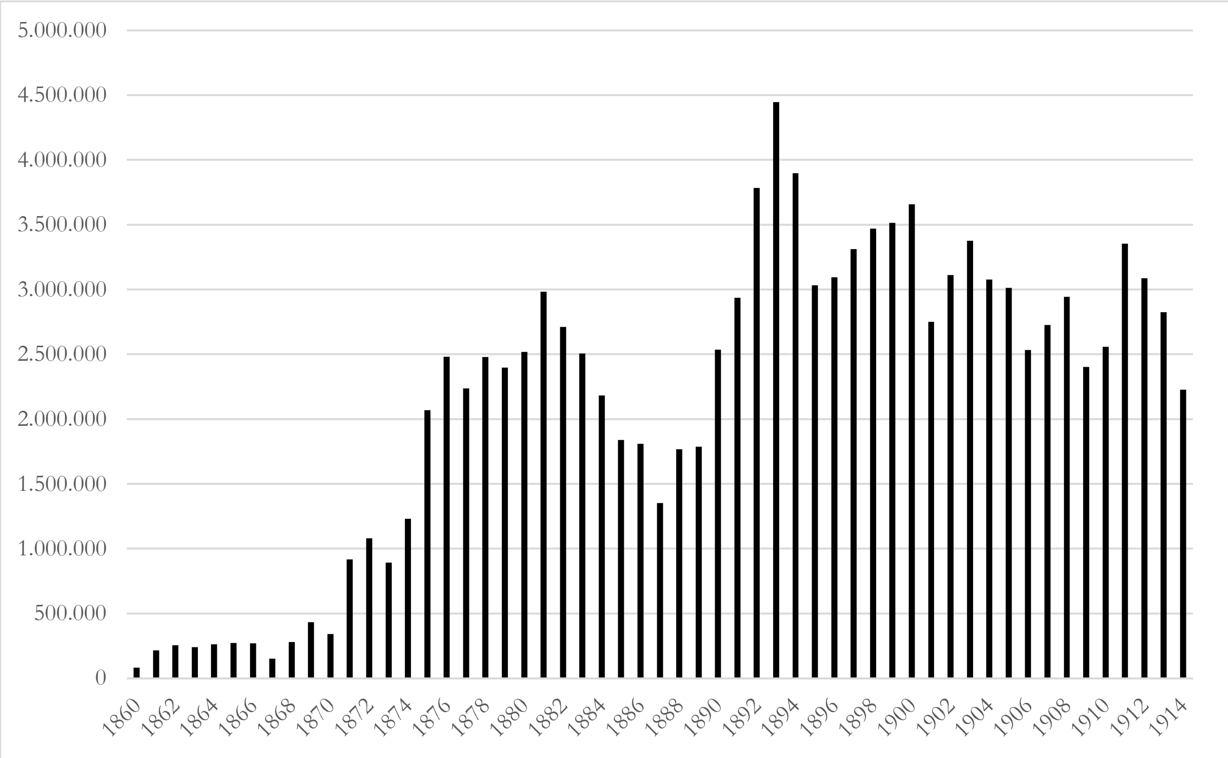

Figure 4: Stock Turnover (sales/inventory)

The following graph displays the ratio of annual sales, i.e. the sum of the realized prices per year, on the value of the stock, displayed in Figure 3.