"Financing Industry in the Dutch Republic: Capital and Credit in Holland's Brewing Industry"

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Abstract

The requirements for capital investment in industry, and fixed capital in particular, are argued to have been modest in pre-industrial Europe. With the Industrial Revolution, however, technological advances in machinery and the development of the factory required greater fixed capital investment than earlier, leading fixed capital investment to predominate over working capital. This paper argues that Holland's early modern state-of-the-art breweries were characterized by large-scale capital investment. Substantial sums of fixed and working capital were required to operate a brewery, with the ratio of fixed to circulating capital depending on the extent of credit extended to customers and distributors. This study shows the complexities of early modern credit system and analyzes the impact of laws seeking to limit asymmetries in information between brewers and distributors and the enforcement of contracts. Finally, this study shows that the traditional informal institutions used to raise capital in early modern Europe, including family networks and partnerships, coupled with institutions securing debt such as mortgages and secured loans, were sufficient to finance the capital needs of large-scale, capital intensive breweries during the Dutch Republic.

Introduction

In examining the role of capital, credit, and finance in early modern economic growth, the literature has focused on their impact in the development of trade. Given the importance of trade for the Dutch Republic, this has also been the case in the study of the early modern Dutch economy. In comparison to trade, relatively less attention has been directed towards the study of industry. Yet, in the Dutch Golden Age, the Dutch industrial sector was the most advanced in Europe and played an important role in stimulating Dutch economic growth. This was true not only of the textile industry that centered on Leiden, one of Europe's largest industrial towns, but also of the capital intensive re-export industries (or trafieken) and mills that played an important role in processing colonial products and agricultural goods.

This case study of the brewing industry examines Dutch business and industrial investment during the Dutch Republic. While by all accounts, the Dutch Republic was a capital rich country in the seventeenth century, remarkably little work has been done on capital investment in Dutch industry. As Leo Noordegraaf noted in the late 1990s, "Little is known of actual investment behavior. What was the relationship between internal and external capital in plans for starting or expanding commercial enterprises? Was there even a capital market open to industrial entrepreneurs? Did entrepreneurs want to be dependent on that market?"[1] While some additional work has been done since Noordegraaf posed these questions, little systematic work has been done on the financing of Dutch industry.

Substantially more research has been carried out in examining the amount and composition of capital required to finance industry in Britain, particularly before and during the Industrial Revolution. Work on capital investment in Britain's industrializing industries led to the consensus that the long-term fixed capital requirements for industrialization in its early phases was limited. Given the simplicity of the technology that was used, the amount of fixed capital required in these industries was small. Further, it was often possible for entrepreneurs to rent parts of buildings that further reduced the amount of capital they required. In fact, according to Mathias, in Britain the needs for short-term credit outweighed the long-term capital needs.[2] Capital expenditures on raw materials, intermediate goods, wages, rent, and the like were greater than fixed capital expenditures. Thus, since large amounts of fixed capital were not required for industrial enterprises, starting and expanding firms did not pose major obstacles to entrepreneurs.[3] Rather, given the lack of a national capital market, the major issue was that of financial intermediation: connecting the wealth of savers with the investment needs of

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[1] Leo Noordegraaaf, "Dutch Industry in the Golden Age," in *The Dutch Economy in the Golden Age* edited by Karel Davids and Leo Noordegraaf, (Amsterdam: NEHA, 1993), pp. 131-58, p. 144. In the following pages Noordegraaf briefly addresses these issues.

[2] Peter Mathias, "Capital, Credit and Enterprise in the Industrial Revolution," The Journal of European Economic History, vol 2, 1973, 121-43, esp. pp. 121-24

[3] Joyce Ellis, "Risk, Capital, and Credit on the Tyneside, circa 1690-1780," in From Family Firms to Corporate Capitalism: Essays in Business and Industrial History in Honour of Peter Mathias, edited by Kristine Bruland and Patrick O'Brien, pp. 84-111, see pp. 84-5.

entrepreneurs. It was only later that industrialized industries required greater fixed capital investment, especially to finance factories.

In summarizing research on fixed capital investment in British Industry in the eighteenth century, Mathias concluded that "One of the most important conclusions of the analyses of capital structure of firms is to show how small a proportion of their total assets, even for the most capital-intensive businesses such as a large-iron works or a London porter brewery, lay in fixed assets. … Historians have had a tendency to over-emphasize the importance of fixed capital, fascinated (as contemporary commentators were) by the physical presence of dramatic new machines and large buildings." [4] As Hicks argued, it was only with the Industrial Revolution that fixed capital came to dominate due to the shift in the relative importance of the factors of production to capital. Thus, for Hicks, prior to industrialization, fixed capital investment too was limited and working capital requirements played a more important part.

Since initial capital requirements for industry were argued to have been modest, scholars of the British situation have emphasized the role of trade credit in capital formation. By inserting one's self into the nexus of credit, it was possible for the entrepreneur to jump-start their business. Further, in evaluating the sources of long-term capital for investment, emphasis has been placed on the importance of family and kinship groups and partnerships. Loans or equity raised from these sources, often secured on their property or pledges, was critical. Given the differences in local market conditions and institutions across Europe, the question is to what extent the British experience is representative of the experiences elsewhere in early modern Europe.

In exploring the financing of business and industry in pre-industrial Holland, this paper focuses on the brewing industry, one of Holland's most important processing industries in the pre-industrial era. In section I, I show that Holland's brewing industry was a capital intensive industry by the seventeenth century, with high levels of fixed capital investment. In contrast to the eighteenth century when fixed capital investment tended to dominate, in the seventeenth century investment in circulating capital exceeded fixed capital investment in breweries with sales beyond the local market. Section II argues that while trade-credit was insufficient to finance a brewery, the effective management of trade credit was essential to a brewery's success and that brewers established rules to limit the impact of asymmetries in information between brewers and distributors. Section III examines the supply of long-term credit to brewers and shows that as in other parts of Europe, the informal intermediates employed in raising capital, including relying on friends, family, and partnerships, in combination with formal institutions securing debt, including mortgages and secured loans, was sufficient to finance industrial investment.

[4] Mathias, pp. 126-7.

I. Breweries, capital, and finance

During the seventeenth and eighteenth centuries, the total amount of capital invested in Holland's state-of-the-art breweries was large by contemporary standards, often exceeding 100,000 guilders and, on occasion, 200,000 guilders. While the ratio of fixed to circulating capital varied from one-to-one to one-to-three, fixed capital investments in physical plant and equipment often amounted to twenty thousand guilders or more, and in eighteenth century Amsterdam regularly exceeded 50,000 guilders. The capital requirements in brewing thus far outstripped those in guild organized trades or crafts. Brewing also required greater investment than other industries organized around a central plant such as distilling and milling where the amount of capital invested was often less than 10,000 guilders. The capital demands for large-scale brewing was perhaps most similar to that required in larger sugar refineries, which also required a substantial physical plant and investment in stocks to carry out the production processes. Although the financial requirements of brewing were exceptional, the industry's history provides important insights into how market process shaped firm size and capital structure and the ability of pre-industrial investors and institutions to capitalize such firms.

The transition in brewing to big business in Holland occurred in the late sixteenth century when state-of-the-art breweries became more capital intensive. Early in the sixteenth century, small-scale artisan firms dominated the industry in Holland's principle export production centers, including Delft, Gouda, and Haarlem. Brewers in these towns, employing three or four workers, brewed relatively small batches of beer and shipped their beers to export markets in the Low Countries, including Flanders and Brabant. In the mid-sixteenth century, however, the scale of brewing began to increase as regulations limiting firm size became a dead letter and competition between brewing centers drove technological change. Brewers in Delft led the way in achieving economies of scale through expanding the scale of their brewing kettles and operations by investing in larger, more capital intensive breweries. These technological changes increased the capital to labor ratio, economized on labor, and reduced per unit energy costs. The expanded scale of production led to the further development of the tied trade, in which brewers lent capital to wholesalers and retailers to help insure stability and predictability for the firm's output. By the late 16^{th} century, the advantages of larger-scale brewing meant that small-scale artisan firms were driven from the market as the minimum efficient scale of the firm increased.[5]

In the late sixteenth and early seventeenth century, the scale of output in brewing continued to increase. In Delft, older breweries dating to the mid-sixteenth century were replaced by newly built and designed breweries. State-of-the-art brewing complexes arose in Haarlem and Rotterdam, towns that would develop into the preeminent export brewing centers in the early to mid-seventeenth century. In the early decades of the seventeenth

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[5] See Richard Yntema, "Entrepreneurship and Technological Change in Holland's Brewing Industry, 1500-1580," in *Entrepreneurs and Entrepreneurship in Early Modern Times: Merchants and Industrialists Within the Orbit of the Dutch Staple Market* edited by L. Noordegraaf and C. Lesger, pp. 185-201. Den Haag, n.p., 1995.

century, the number of breweries in Haarlem grew rapidly: from less than a dozen in the 1590s to fifty-some breweries by mid-century. In Rotterdam the rapid expansion of the industry dated from the early 1620s, as new breweries were constructed near the harbor.

The more modern, state-of-the-art breweries required larger fixed capital investment.[6] According to Bijlsma, the typical brewery including its equipment generally sold for more than 40,000 guilders in the early decades of the seventeenth century. There were, of course, breweries whose fixed capital investment was substantially smaller. It was not uncommon for a smaller brewery to be sold for 8,000 to 12,000 guilders. (To put this in perspective, the sales price of a typical house in Rotterdam at the time was perhaps a thousand guilders.) Assuming that equal amounts of circulating capital were required, brewing could be carried on with a relatively modest investment of sixteen to twenty-four thousand guilders. Yet, as larger, new breweries were built, especially in the 1620s, many of these smaller firms shut their doors.

In the mid-seventeenth century, the capital invested in breweries in Rotterdam ranged between 25,000 guilders for the smaller firms to more than 150,000 guilders for the largest breweries. Capital investments in excess of 100,000 guilders were relatively common in Rotterdam's breweries. For example, in 1645 Vincent Bouwensz bought the Witte Paard brewery for 104,891 guilders and 14 stuivers, including all of the buildings, grains and raw materials, and outstanding book debts.[7] The sale of "De Witte Leeuw" at mid-century reflects perhaps the height of capital investment for an individual brewery at mid-century. In 1649, Dammis Jansz Pesser sold his half of this brewery to his sister, Meyntje Jansdr Pesser (the widow of Petrus Cupus, a minister) where her son Tielman Cupus was the brewer. Dammis Jansz's half of the brewery, malting house, cooperage, and other buildings on the Leuvenhaven sold for 20,000 guilders. His half of the company of the Witte Leeuw which exploited the brewery was sold separately for 62.500 guilders. The company's assets included not only all of the equipment, grain, and other inputs used in brewing, but also the brewery's windmill and horse mill that was located outside of the Cool Poort. The total value of the capital invested in the brewery amounted to 165,000 guilders with a working to fixed capital amounted to three-to-one.[8]

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[6] In analyzing the amount of capital invested in breweries and how they were financed in the Dutch Golden Age, it would be ideal to be able to make use of the extensive business records that brewers kept. Documents in the notary archives demonstrate that brewers kept extensive books that were required to demonstrate the legality of their outstanding debts in court and the payment of excise taxes. Many of the breweries organized as companies drew up annual balances on the basis of double entry bookkeeping that underlay the annual statement of profit and loss. Unfortunately, the detailed firm records that brewers once kept and often underlie the study of brewing elsewhere, including in Britain, have not been preserved in Dutch archives. Consequently, we must rely on the other kinds of scattered records to understand the amount of capital invested in breweries and how they were financed. Evidence on the sales price of breweries is included in town records recording the transfer of real estate. Since these records do not include the amount of the circulating capital invested, evidence on these amounts must be culled from other sources. For evidence on the capital employed in breweries, use has been made of the annual statements of the Hooiberg brewery and various documents drawn up by notary publics, including probate records, partnership papers, and the like.

[7] GAR, Notarial Archive, 3-6-1646, notary public Jacobus Delphius, 367 62/155.

[8] The price of breweries includes not only the facility for brewing, but also the house in the complex in which the brewer lived. The inclusion of housing under fixed capital overstates the amount invested in capital specific to brewing. In this paper the value of the housing has not been capitalized and deducted from the

The sales price of the fixed assets for two other breweries sold at mid-century suggests that total capital investments exceeding 150,000 guilders as in the "De Witte Leeuw" were not have that exceptional. In 1646, the 'Witte Leeuw met den Staf' that had belonged to Willem Allardsz van Couwenhoven (a member of the Vroedschap) was sold to Nicolaas Cupus (Tielman's brother) for 74,000 guilders.[9] A year later, in 1647, Jacob Jacobsz van Couwenhoven sold his brewery 'de Twee Klimmende Leeuwen' to Vincent Bouwensz, co-owner of 'de Witte Paard,' for 85,000 guilders. The sale of the brewery complex included the brewery, malt-house, horse-mill, the house in which the brewer lived, and three houses along with all the equipment, including nine mill horses.[10] The total capital invested in the two breweries must have been considerable, since these sale prices do not include the outstanding book debts.[11] If the book debts were one to two times the price of the building and the equipment, the total invested capital would have ranged between 150,000 and 170,000 guilders for these breweries.

Less evidence is available on the amounts and composition of the capital invested in breweries in Haarlem, Holland's other major brewing center. Of the more than 50 breweries that operated in Haarlem during the early seventeenth century, only a handful of probate records have been identified, most of which give fragmentary insight into the industry's capital requirements. The most complete probate inventory is for the estate of Neeltgen Hendricxs and Jan van Brienen and it details the amount of capital invested in the Dubbelde Ancker Brewery at the time of her death in 1627.[12] The capital invested in the somewhat larger than average brewery amounted to 36,800 guilders.[13] The value of the brewery, including all of the equipment, was appraised at 17,000 guilders, or 46 percent of the total investment. The collectable book debts amounted to 16,000 guilders, or 43.5 percent of the capital. The value of the grain and malt in the brewery was 3,000 guilders and there was 800 guilders on hand in cash. Other probate records in Haarlem for the seventeenth century sketch a roughly similar pattern: fixed capital investment accounted to about half of the capital invested, and circulating capital making up the other half.

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firm's fixed capital investment. In Holland it was the norm for owners of business to live where they worked; the firm and home were not yet distinct. Thus, sugar refiners also lived in the house attached to the refinery.

[9] Nicolaas Cupus was the son of Meyntje Jansdr Pesser, and the brother of Tielman Cupus who was the brewer in "De Witte Leeuw". The brothers Cupus were also the brothers-in-law of Anthony Nijs, who was the brewer in "den Osch," later called "De Twee Paerden."

[10] Bijlsma, *Rotterdams Welvaren*, pp. 103-104. See GAR, Notarial Archive, 15/4/1647, notary public Arent van der Graeff, 335 338/821. In addition, Couwenhoven, who was also the ambachtsheer van de oude en nieuwe streuyten, sold another malting house for 11,000 guilders to a malter, Huybrechtsz van 't Wedde. See GAR, Notarial Archive, 18/6/1647, notary public Arent van der Graeff, 335 174/437.

[11] Cornelis van Persijn, a beer wholesaler in Amsterdam owed Couwenhoven 19,700 guilders according to an account they settled on 20 August 1647, not including the 25,000 guilder schepenkennisse he had signed before the schepenen in Amsterdam in April of 1646. GAR, Notarial Archive, 22/8/1647 Notary Public Arent van der Graeff 335 149/379

[12] Richard J. Yntema, "The Brewing Industry in Holland, 1300-1800: A Study in Industrial Development," Ph.D.Dissertation, University of Chicago, pp. 196-7. See Egbert Lucasz van Bosvelt, notary public, GAH, NA 61, folios 283-86, dated 12 October 1632.

[13] On the basis of the average number of brews brewed per year, the brewery's output ranked 18 of 47 in Haarlem, or somewhat larger than average.

The evidence on the price of equipment and tools used in brewing (not including the brewing kettle and other equipment that was "fixed to the earth or nailed to the structure") shows that it typically exceeded 10,000 guilders.[14] Bijlsma concluded that equipment generally accounted for about half of a brewery's fixed assets in Rotterdam.[15] In the sales of the Witte Leeuw met den Staf and the Twee Klimmende Leeuwen noted above, the share of the equipment was somewhat smaller. When the Witte Leeuw met den Staf was sold in 1646, the buildings cost 48,000 guilders, while the equipment sold for 26,000 guilders or 35% of the fixed capital. In the sale of the Twee Klimmende Leeuwen in 1647, the buildings sold for 53,000 guilders, while the inventory and equipment sold for 32,000 guilders or 38% of the fixed capital.[16] Again, in both of these sales, the value of the equipment is understated since the value of the brewing kettles would have been included with the sale of the building, not with that of the equipment.[17]

While the paper so far has focused on the development of capital investment in Rotterdam during the seventeenth century, it should be noted that the scale of capital invested in brewing varied widely across Holland's towns. In smaller towns in Holland, where the price of real estate was relatively low and markets were limited, the capital requirement for brewing was more modest. Fixed capital investments of 10,000 to 15,000 guilders appear to have been the norm.

The remarkable capital investment in breweries in Rotterdam, Haarlem, and other towns in the seventeenth century, stemmed from the competitive market conditions in Holland's brewing sector that stimulated the drive to realize the economies of scale inherent in the technology of brewing. Increasing the scale of production and maximizing throughput led to lower per unit production costs. In brewing, all the steps in the production process were typically carried out in a centralized plant from malting the grain to distributing the beers. In the plant, the brewing kettles stood central. On average, brewers in Rotterdam produced 14,000 liters of beer each time they brewed, which might be three times a week or more. At this scale of production, brewing was carried out as a

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[14] For the rule and other exceptions, see Peter Mathias, *First Industrial Nation* (London: Methuen, 1983) 2nd ed., pp. 110-19 Also see Carlo M. Cipolla, *Before the Industrial Revolution* (New York: Norton, 1980), 2nd ed., pp. 96-107.

[15] Bijlsma, *Rotterdams Welvaren*, pp. 103-104.

[16] Bijlsma, *Rotterdams Welvaren*, p. 104. Other examples suggest similar ratios of equipment to buildings. In 1717 when the Weduwe Harmanus Gosinck sold the Hooiberg brewery to Nicolaas Noppen, all of the buildings were sold for 32,000 guilders, or 62% of the fixed assets, while the equipment (including all the barrels, copper beer kettles, 11 horses, waterships, etc) were sold for 20,000 guilders, or 38% of the total. See I. H. van Eeghen, "De brouwerij de Hooiberg," *Jaarboek van het Genootschap Amstelodamum*, vol. 50, pp. 46-97, p. 57.

[17] Need comparison with Britain: Earle argues that while manufactures had the largest share of fixed investment –fixed capital investment was less than 1000 pounds. Fixed capital amounted to 15 percent of total assets. Ala Earle, "This is a commercial society where stock in trade and not equipment is what matters. … Manufactures, too, were wholesalers in respect of the selling side of their businesses and they came second in the proportion of assets held as trade credits, nearly 47 percent." (p.122)

vertically integrated business and required considerable physical space.[18] The various steps in the production process, including the malting and the milling of the grain and cooperage, were carried out in the brewery.[19] The continued movement towards vertical integration in this era was motivated by all of the same considerations that led to increased vertical integration in the early twentieth century: cost efficiencies, greater control over the production process, and greater quality control than was possible to attain in market based transactions.

Brewing thus required not only much more capital than craft organized industries, but its investment structure was also radically different than proto-industrial production organized by merchants. For merchants, it was possible to decentralize production and shift much of the burden of fixed capital investment to workers who spun or wove cloth at home. For the cloth merchants, working capital investments thus surpassed fixed capital investment. With the development of the manufactory or factory during industrialization, this was no longer the case in the textile industry. Instead, textile producers integrated the various steps in the production process into a single plant with the often cited invention of the factory.[20] In the factory, the mechanized production process centered around a single power plant, whether it was driven by water or steam. The development of the factory, which stands central in the narrative of the industrial revolution, was a development that occurred earlier in other industries, including in brewing. Like other "chemical" or "processing" industries, beer brewing, sugar-refining, soap manufacture, etc., the production technology facilitated the organization of production in a central plant where the various steps in the production process were coordinated, thus increasing the amount of fixed capital investment above that needed in other industries.

In the early eighteenth century, Amsterdam emerged as Holland's preeminent brewing center. During the mid-to-late eighteenth century, Amsterdam's breweries were among the largest in Holland, typically processing more grain than breweries in other towns. The growth of the industry in Amsterdam was in part related to protectionist policies that closed off markets in Amsterdam to brewers in other towns, including brewers in Haarlem and Rotterdam for whom Amsterdam had been an important market. Given the protectionist measures, Amsterdam's brewers had important advantages in selling beer in the town and, on top of this, Amsterdam had the largest population Holland's towns. Further, the town's leading brewers sold beer to a broad range of ships that set sail from the town.

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[18] In the early seventeenth century, brewers in larger breweries had their own horse-mills that were used to mill the grist used in brewing. This development suggests that the output of firms and the cost advantages of in-house milling were sufficient to warrant the expense of the mill.

[19] While malting had often been combined with brewing in fifteenth and sixteenth centuries, this typically had not been the case with milling and cooperage.

[20] For a recent claim regarding the significance of the invention of the factory in the textile production, see Robert Allen, *The British Industrial Revolution in a Global Perspective*, p. 195. "Arkwright's contributions went beyond the water frame, however. He also patented a carding machine …. In addition, he invented the cotton mill. This was a multi-storey structure in which the machines were arranged for efficient material flow and power transmission. Part-time work, and with it the part-time utilization of capital, were eliminated (Marglin 1976). "

As shown in Table 1, the capital invested in Amsterdam's breweries ranged between some 100,000 guiders and 253,00 guilders. Aside from the Witte Haan brewery, the fixed capital invested in all of these breweries exceeded that of the working capital. Typically, 60 percent or more of the capital was fixed equipment. The data for Amsterdam show that fixed equipment (including the brewing kettles) and the moveable equipment (including beer barrels) were significant. In Anker brewery in 1740, the value of fixed and moveable equipment, almost equaled the value of the plant it self. In the Drie Roscammen, the value of the equipment amounted to 14,000 guilders (11 percent of the total) in 1756, while the plant accounted for 50 percent of the total investment.

The balance sheets for the Hooiberg Brewery in Amsterdam, the town's largest brewery, shows a similar capital structure. In 1772, the capital of the eleven partners that owned the firm in 1772 amounted to more than 253,000 guilders when the balance sheet was made up. The brewery's buildings made up a large share of the investment: almost 60 % of the assets. Cash made up the next largest post on the balance sheet. The brewery had more than 77,000 guilders in cash on hand when the books were closed, or about 30 % of the assets. In comparison, the value of the grain and beer on hand and the firm's book debts were small. In short, fixed capital investment was significant in Amsterdam's breweries and tended to dominate the investment in circulating capital.

As shown in Table 2[21], the percentages of fixed and circulating capital in the much smaller Gekroonde Star, Fles, Zwaan and Vijfhoek Brewery in Enkhuizen are similar to those for Amsterdam's much larger breweries. Fixed capital investment accounted for 58 percent of the total, while the circulating capital made up 42 percent of the total assets. Between 1774 and 1791, the total capital invested in the brewery declined from about

[21] Yntema, "Brewing Industry," p. 206.

Table 1: Capital Investment in Breweries in Amsterdam in the 18th century

Brewery	Year	Plant	%	Fixed Equipment	%	Moveable Equipment	%	Stocks	%	Book Debts	%	Accounts Payable	%	Cash	%	Total Capital	Fixed Capital	%	Circulating Capital	%
Ankers	1740	40,000	38.2	<< 38,600	36.7%	>>		<<		26,400	25.1%		>>			105,000	78,600	75	26,400	25
Drie Roscammen	1756	45,000	49.8	<< 14,000	10.7%	>>		31,000	23.8	9,350	7.2	923		11,901	9.1	130,428	79,000	61	51,428	39
Drie Roscammen	1773	<<		154,800	64.5%	>>		<<		85,200	35.5%		>>			240,000	154,400	65	85,200	36
Drie Schulpen	1713	<<	35,700	>>		7,451		7996		8,148		??		??						
Drie Schulpen	1720	<<	35,700	>>		11,434		14,019		9,582		??		??						
G.D. Sleutels	1783	<<	82,000	>>		6,460		7,492		2,840		12,358		2,853		114,003	82,000	72	32,003	28
Gekroonde Valk	1741	<<	80,000	>>		<<		48,762	37.9%			>>				128,761	80,000	62*	48,762	38*
Gekroonde Valk	1747	<<	80,000	>>		<<		50,000	38.5%			>>				130,000	80,000	62*	50,000	39*
Gekroonde Valk	1763	<<	56,000	>>		<<		38,944	41.0%			>>				94,944	56,000	59*	38,944	41*
Hooiberg	1772															253,000				
Roode Hart	1778	<<	97,650	>>		<<	33,891	>>		9,565		??		1,008		??				
Star	1759	<<	63,200	>>		<<		44,800	41.5%			>>				108,000	63,200	59*	44,800*	42*
Witte Haan	1731	<<		95,000	42.9%	>>		54,758		71,640						221,398	95,000	43	126,398	57

* percentage understates the percentage of fixed capital investment since the valuation of moveable equipment and stocks are combined and these values have been included with the circulating capital.

29,000 guilders to about 20,000 guilders, averaging about 25,000 guilders over the period.. Unlike many other firms, the consortium of breweries in Enkhuizen revalued the buildings

Table 2: Capital Invested in the Gekroonde Star, Fles, Zwaan, and Vijfhoek Brewery in Enkhuizen, 1774-1791

Year	Buildings	Ship parts			Inputs				Subtotal	Book	Cash	Wood wares	Total
	Equipment		Malt	Hops	Turf	Water	Beer	Casks		Debs		in the Fles	
1774	17000	890	280	77	605	145	453	266	1826	5457	4035		29208
	(58.2)	(3.05)	(0.96)	(0.26)	(2.07)	(0.50)	(1.55)	(0.91)	(6.25)	(18.68)	(13.81)		100.00
1776	16000	890	1004	105	468	120	1483	368	3548	2962	4819		28219
	56.70	3.15	3.56	0.37	1.66	0.43	5.26	1.30	12.57	10.50	17.08		100.00
1777	15500	890	599	155	247	130	1133	460	2724	2905	4215	364	26598
	58.28	3.35	2.25	0.58	0.93	0.49	4.26	1.73	10.24	10.92	15.85	1.37	100.00
1783	12500	290	353	66	333	125	250	250	1377	3307	2316		19790
	63.16	1.47	1.78	0.33	1.68	0.63	1.26	1.26	6.96	16.71	11.70		100.00
1790	12000	290	444	293	493	125	339	339	2033	5044	1997	207	21571
	55.63	1.34	2.06	1.36	2.29	0.58	1.57	1.57	9.42	23.38	9.26	0.96	100.00
1791	11500	290	357	322	288	135	320	231	1653	4794	1791	50	20078
	57.28	1.44	1.78	1.60	1.43	0.67	1.59	1.15	8.23	23.88	8.92	0.25	100.00
Average	14083.33	590	506	170	405.7	130	663	319	2193.5	4078	3196	103.5	24244
	58.21	2.30	2.06	0.75	1.68	0.55	2.58	1.32	8.95	17.35	12.77	0.43	100

and equipment each year, rather than simply using historic values. Between 1774 and 1791, the value of the fixed capital diminished from 17,000 guilders to 11,500 guilders. Overall, the decline in fixed assets accounted for much of the decline in the firm's total value.

Circulating capital accounted for about 42% of the investment in the brewery. Overall, the inputs including malt, hops, turf, and water, and the finished beer, and the casks accounted for about 9% of the total. The brewery in Enkhuizen apparently did not hold large stocks of grain, but must have bought these on the open market as necessary. The firm's book debts, or the credit it extended to its customers, averaged about 17% of the firm's assets, while cash on hand ran in the order of 13%. Put somewhat differently, on average, of the circulating capital, book debts accounted for 43.4% of the total, cash 34%, and the raw materials, intermediate goods, and beer, 22.6%.

Although the ratio of fixed to circulating capital is similar between the sample of Amsterdam's breweries and the brewery in Enkhuizen, the difference in the total capital invested is striking. In Holland, the capital intensity and scale of brewing was clearly linked to the market where the brewery was located. In Enkhuizen, brewers were undoubtedly protected by local tariffs that permitted the survival of the firm. Not only was the scale of operations smaller, the overall level of fixed capital required was also less because the price of real estate was much lower than in Amsterdam. Yet, the similarity in the overall ratio of fixed to working capital between the breweries in Amsterdam and Enkhuizen suggests that there were underlying commonalities in the structure of the market in these two towns: much of the sale was directed to local residents. In Rotterdam and Haarlem, however, the amount of credit extended to customers was much greater.

This was apparently a necessity when the industry sold much of its output beyond the town and was required to take proactive steps to maintain distribution networks to maintain its market share and establish a steady demand for its product.

II The Credit Nexus: brewers, suppliers, and distributors

The role of credit and trade credit occupies a central place in the literature on the financing of firms in the pre-industrial era. One strand in the literature emphasizes the possibilities inherent in using trade credit to finance the initial growth of the firm given the limited investment in fixed capital.[22] More specifically, it has been argued that the need for capital was mitigated by the ability of firms to use trade credit to finance the firm. As the previous section has shown, the fixed and working capital needs in brewing were beyond that which could be raised by judicious use of trade credit alone.[23] Yet, since trade credit was ubiquitous, how did brewers manage trade credit and balance their trade credits and debts? This was all the greater a problem for contemporary brewers given the asymmetries in knowledge about their debtor's ability to repay the loan, a second major issue in the literature.[24] The first part of this section addresses the first question, while the second section addresses the institutional mechanisms brewers put in place to control for asymmetries in information and to help enforce contracts.

The tangled web of trade credit

In an era in which formal financial intermediaries, like banks, are argued to have played a limited role in financing industry --although more extensively than previously thought in England—and fixed capital needs were small, scholars have suggested that the judicious use of trade credit in England played an important role in financing industry and in accumulating capital. In modern-day firms this form of finance is commonplace in the financial calculations of companies as they attempt to manage their payments so that they get cash for the goods they sell before they need to pay their suppliers, thus allowing them to make money on their cash flow. Writing in the early eighteenth century, Daniel Defoe too saw the advantages of using trade credit. The effective management of trade credit allowed the tradesman, as Defoe put it, 'to trade for a great deal more than [they] otherwise would do.' Trade credit, promissory notes, and bills of exchange all played a hand in this.

Brewers, like merchants, tradesmen, and other industrialists, also relied on receiving and extending trade credit in financing their firms. Trade credit was ubiquitous. Brewers relied on trade credit to purchase inputs, including grain and hops, and extended credit to their customers for the beer they bought. As Peter Earle noted, for early modern

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[22] Mathias, "Capital, Credit, and Enterprise in the Industrial Revolution," pp. 128-9.

[23] According to Mathias, the demands for fixed capital assets were small in Britain since the technology was simple (the average Arkwright type mill costing 2,000 pounds), the ability to lease buildings or parts of them, and the fact that machinery could be built directly by workers or leased.

[24] Philip T Hoffman, Gilles Postel-Vinay, and Jean-Laurent Rosenthal, *Priceless Markets: The Political Economy of Credit in Paris, 1660-1870*, (Chicago, University of Chicago Press, 2000).

businesses, the problem of cash flow stood central and was "a problem which governed most of the tactical and strategic decisions of the businessman."[25] The problem for the businessperson was to balance the complex system of debits and credit that was customary. While the annual statements of large scale breweries like the Hooiberg Brewery in Amsterdam show that firms kept well-ordered accounts, the extensive book-keeping of such breweries has been lost. Further, the letter books of breweries have also not survived. Consequently, it is not possible to directly use firm records to trace a brewer's efforts to balance the complex and extensive system of credit that characterized Holland's brewing industry, and the economy more generally.

The complexity and scale of contemporary credit arrangements is clearly shown in many of the probate inventories recording the estates of brewers.[26] Since in this era the business accounts and personal finances were intertwined, probate inventories provide in principle a full picture of the financial position of a brewer's business and their personal wealth. The probate inventories show the amounts owed for the purchase of inputs, raw materials, intermediate goods, and wages. So too, they detail the credit brewers extended credit to for sales to their customers, including taverns, wholesalers, and individual customers. Yet, since there was often a time lag between the time of the brewer's death and the time when the inventory was drawn up, it is to be expected that the probate inventory would not fully reflect the firm's position at the time of the brewer's debts. The payments for outstanding debts that a brewer would have had would have been used to pay down outstanding debt in the meantime or would have been included as cash. While such practices would not impact the firm's net assets, they would not fully indicate the extent of the firm's outstanding debits and credits.[27]

Important as trade credit was, brewers also required cash balances to settle up their accounts as payments fell due. How much cash brewers had on hand in the seventeenth and eighteenth centuries is difficult to determine. As was the case in England, cash assets probably made up a small percentage of the total value of the estates.[28] In the eighteenth century, the cash balances of the larger breweries was apparently substantial. In the case of the Hooiberg in Amsterdam, which was certainly among the best capitalized breweries in Holland, cash balances of more than 50,000 guilders were common on the balance statements. Such cash reserves allowed the firm to purchase grain when advantageous. Towards the end of the eighteenth century, there is also evidence that the brewery engaged in discounting bills of exchange to make short term gains on its cash reserves.

Much of what the brewer needed to brew could be financed with trade credit. This is borne out by the debts listed in the probate inventories of brewers to grain merchants and

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[25] Peter Earle, *The Making of the English Middle Class: Business, Society and Family Life in London, 1660-1730,* (London: Metheun, 1989), p. 106

[26] Records of a firm's debits and credits are also included in the records and accounts made by the town's chamber for insolvent estates and in the accounts of orphanages and weesmeesters. In addition, notary records contain many records regarding disputes between brewers and suppliers and distributors regarding the extension of credit. These cases in which recourse to legal process was necessary help inform us about contemporary business practices, but their ad hoc nature is problematic. In this regard, probate inventories give a more complete picture of how firms financed credit needs.

[27] In addition, they also detail the brewer's personal accounts at the time when the inventory was made up.

[28] Earle, pp. 120-1.

brokers specializing in grain and for debts owed for coal, hops, and occasionally legal fees. Gaining an understanding of what such trade credits typically totaled for a brewery is, however, a matter of conjecture at this point. Yet, it is clear that such credits must have been substantial, often falling in the range of 10,000 to 20,000 guilders. In some cases, it was much larger. For example, when the brewer Fries went bankrupt in the Hooiberg brewery in Amsterdam in the mid-eighteenth century, he owed more than 50,000 guilders to Dirck Hasselaar, a grain merchant.

As I have outlined above, brewers extended considerable trade credit to their customers. In the seventeenth century, such practices were the norm for merchants, tradesmen, and craftsmen: one person's debt was another person's credit. The situation in Holland must have been much the same as Defoe described in England, where he claimed 'the general Trade of this country has been more carry'd on by Credit, than manag'd with the Species of Money." The larger percentage of book debts (43.5%) included in the inventory of the estate of the Haarlem brewer Neeltgen Hendricxs described above indicates the important role the extension of credit played for brewers. Since less than 800 guilders of good outstanding debts were from Haarlem at the time of the inventory, many of the smaller debts in Haarlem for the sale of a quarter or half barrel of beer must have been paid. By far the largest part of the trade credit had been extended to 18 wholesalers, of which nine were located in Holland (Enkhuysen, Woerden, Koudekerk (2), Boskoop, Warmond, Medemblick, and Alkmaar (2); six in Friesland (Makkum, Bolsward, Staveren, Molkwerum, Franeker (2); one in Utrecht (Nienbrugge); and one in Overijssel (Blokzijl). The debts owed by wholesalers ranged from 130 guilders to 4,100 guilders, and averaged 1,343 guilders.[29] Almost a third of the trade credit was written off as uncollectable. Only 16,000 of the 24,867 guilders owed to the brewery were considered collectable.

The extension of credit on this scale was not unique to Haarlem brewers. After the death of Hugo Bowensz, a brewer in Rotterdam, an extensive inventory was drawn up of his estate (in the late seventeenth century). The outstanding beer debts owed to the brewer in the "Twee Klimmende Leeuwen" were substantial, amounting to more than 26,000 guilders. Seven wholesalers in Amsterdam owed 7,454 guilders while other debts outside of Rotterdam amounted to more than 7,500 guilders. The beer debts that remained to be collected in Rotterdam amounted to somewhat more than 11,000 guilders. Even more disconcerting to the heirs was the extent of the brewery's bad beer debts. While 13,500 guilders of debt were listed as questionable, 19.065 guilders of debt had been written off since there was no hope of these to be collected.[30]

Nonpayment of credit that had been extended could readily lead to a long protracted process of debt collection. As a first step in collecting, brewers apparently went to the homes of their debtors, or sent a bill collector or someone else on their behalf. If payment was not made, brewers generally appear to have turned the trade credit into a note at interest, and preferably one that was secured by collateral. While the necessity of

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[29] Yntema, "Brewing Industry," p. 197.
[30] R. Bijlsma, "De brouwerij "de Twee Witte Klimmende Leeuwen"" in *Rotterdamsch Jaarboekje* vol 9., 1911, pp. 126-138.

signing a long-term note may have impinged on one's credit rating, such notes appear to have been quite common. In many cases, to increase the certainty of repayment, brewers made use of formal institutions, like passing the note before the schepenen or notaries. Loans secured by property provided borrowers with capital and liquidity. When non-payment of the interest occurred or the extension of additional credit was necessary, brewers then employed all the legal means at their disposal to receive payment, including legal procedure against the debtor's guarantors. Following the court order, the collateral was sold by public auction or the brewer assumed possession of it.

When a brewer could not make a payment, long-standing suppliers may well not have worried too much depending on their own credit condition and the brewer's reputation. Yet, notary records also contain many agreements made by brewers with suppliers in which short-term trade credit was turned into a long-term interest bearing loan, often with the brewery as collateral. This means of securing trade credit was undoubtedly the preferred option for the supplier over forcing the brewer into bankruptcy. Not only were such proceedings costly and time consuming, but the chances of receiving one's capital back were limited. In most situations, it must have been a better strategy to come to some kind of understanding and turn the trade credit into a long-term loan and wait for market conditions to improve and recoup the debt, especially since forcing a bankruptcy had consequences for other parties in the communal network that owed, or were owed, money by the brewer.

The notes that were made by brewers, suppliers, and wholesalers for their debts, whether secured or not, were negotiable. How common such practices were is difficult to ascertain, but judging from evidence in the notary archives, this was probably the norm. Grain merchants, for instance, accepted promissory notes made out by beer wholesalers to brewers for the payment of grain. The negotiability of promissory notes thus increased the money supply –and made it easier to settle debts. It also transformed short-term trade credit into long-term capital.

Trade credit thus was a double-edged sword and needed to be understood and handled judiciously. While trade credit alone was not an adequate foundation on which to build a brewing enterprise, the effective management of credit was a pre-requisite for survival and growth. Much of the financial fortune of a brewer must have depended on their ability to adjust the firm's operations to the phase in the business cycle in which they operated and on their access to longer term credit. Nonetheless, as the bankruptcy of the Hooiberg brewery in the mid-eighteenth century described below attests, excessive investment and lack of attention to the fundamentals of the business could also spell disaster. While trade credit helped many brewers profit and see their firms grow, especially in good times, other brewers failed to achieve this even in the best of times.

The tied-trade: informational asymmetries and institutional change

The growth of the tied trade has long been viewed as one of the critical developments in the history of the British brewing industry, especially as the scale of breweries and the competition between them increased. In the tied trade, sometimes viewed as a precursor of franchising, manufactures finance the extension of credit to retailers providing the manufacture with a fixed point of sale. According to Peter Mathias, the development of the tied trade was unique to British brewers before the Industrial Revolution, and was not something that was practiced on the continent or by North American brewers.[31] Yet, as shown above, brewers in Haarlem and Rotterdam, and other towns for that matter, typically provided considerable trade credit to distributors and sometimes owned the building in which they operated. Brewers also entered into exclusive delivery contracts with wholesalers and distributors. These contracts with their financial tie are at the heart of the tied-trade and in the case of Holland's brewing industry date back to the fifteenth and sixteenth centuries.

In Holland's major beer producing towns, the success of the industry depended on each firm building up (or participating in) a distribution network which typically included tied-trade. These distribution networks included both independent wholesalers and retailers and distribution points that were financed by the brewers. While independent wholesalers were free to buy beer from the brewer of their choice, in many cases brewers and distributors entered into contracts with each other for the delivery of beer.[32] In some cases, brewers and wholesalers made a contract in which the wholesaler obtained credit from the brewer to finance the establishment of their business with the promise that they would exclusively purchase beer from that brewer. In many cases, however, wholesalers and brewers entered into a contractual relationship when the wholesaler had outstanding debts and was not able to pay the brewer. In this case, to help insure the repayment of the beer debt, the trade credit was transformed into long-term debt and the wholesaler was typically contractually required to buy their beer from this brewer. While in this scenario the wholesaler lost their independence, they nonetheless were able to carry on their business and avoid bankruptcy.

In both cases, the contacts between brewers and their distributors typically specified the amount of credit to be extended by the brewer; the type, price, and quality of the beer to be delivered; if the wholesaler could obtain beer from another brewer or not; and the conditions under which the wholesaler could move to another brewer. Such agreements which are at the heart of the tied trade assured a brewery a steady demand for its beer and allowed the firm to rationally plan its production process.[33] These enforceable contracts offered advantages for both parties. In addition to credit, a distributor was assured a regular supply of beer at a given quality. The contract helped assure the brewer a steady market for their beers and plan production accordingly. Equally importantly, the contract helped the brewer limit their exposure to the distributor since in towns like Haarlem and Rotterdam, brewers could prohibit other brewers from delivering beer to their distributors or, if they did so nonetheless, to have to pay distributor's debt to the brewer.

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[31] Mathias, *The Brewing Industry in England*, pp. 117-38

[32] For the contract between a brewer in Haarlem and a beer wholesaler in Amsterdam, see Van Dillen, *Bronnen*, vol. 2, number 512.

[33] In Rotterdam we see also see brewers make contracts with beer shippers –who may also be wholesalers. Brewers often made contracts with shippers in which the brewer paid for or guaranteed the loan on a ship and the shipper agreed to distribute the beer. While Mathias underscored the importance of fixed distribution points in the tied trade, the contracts with beer shippers suggests an important variation on the tied trade in Holland were waterways played a critical role in linking the region together.

The municipal laws that permitted brewers to prohibit other brewers in the town from delivery beer to a distributor were a part of the brewers' guild byelaws. The byelaws as we encounter them in the seventeenth and eighteenth centuries, are very similar to byelaws covering the same issue that were enacted in export brewing centers like Gouda, Haarlem and Delft in the late sixteenth century that originated after Holland's brewers developed distributional systems based on extended credit. A sixteenth century ordinance enacted in Delft, allowed a brewer to prohibit another brewer in the town from delivering beer to their distributor after such a delivery was discovered. If the second brewer persisted and made a delivery, the original brewer could demand that the second brewer guarantee the payment of the distributor's debts (including the value of the barrels) before the town's *gerecht*. Similar articles are found in the by-laws governing the brewers' guild in Haarlem and Rotterdam in the seventeenth and eighteenth centuries. These laws did not *per se* inhibit competition between brewers; rather, they increased the brewer's certainty that they would receive payment for the beer they had delivered.[34]

Such laws arose as part of an effort to increase the enforceability of contracts and to deal with asymmetries in information. The contracts between brewers and wholesalers, of course, did not provide certainty of payment for the brewer. The brewer had to continue to monitor the distributor's creditworthiness, largely, undoubtedly, by tracking their payment history. When the distributor failed to pay, one possible strategy for the brewer to obtain payment was for the brewer to suspend the delivery of beer. This, however, would only be effective if the distributor could not receive delivery of beer from another brewer in the town.[35] In such a situation, the distributor's interests would dictate that they would try to buy beer from another or second brewer. So too, the second or 'new' brewer would profit from this arrangement since they would be able to require cash payment upon delivery or the next delivery. If the second brewer's assessment of the distributor's credit was radically different, this brewer might even extend more credit. For the initial brewer, the by-law established a formal rule governing the transfer of debt, thus increasing her certainty of receiving payment.

The guild by-law thus aimed to increase the certainty that a brewer would be able to control the extent of the credit supplied to a wholesaler by the town's brewers, and thus give the brewer greater control over repayment. In many respects, the law aimed to address the lack of information that a brewer had about the extent of a wholesaler's credit. In contemporary society, credit agencies pool information from diverse sources for lenders, and each lender makes an individual decision regarding the borrowers credit worthiness and interest rate to be charged. Here too, there is the potential that subsequent lenders will provide more credit to a borrower, thus reducing the chance that initial lenders will be able to obtain repayment. The guild by-laws were designed to reduce the likelihood of this for the town's brewers and, just as importantly, to reduce the collective exposure of the town's brewers to a single distributor.

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[34] Yntema, Brewing Industry, p. 243.
[35] In this period, while each brewery in a town had its own brand name, beers brewed in each town had distinctive style characteristics. Thus, a beer brewed by one brewery in Delft would be a close substitute for another beer brewed in Delft, but not a close substitute for a beer brewed in Haarlem.

In the case when a brewer discovered that a second brewer was delivering beer to one of the first brewer's customers against his will, the brewer could take various steps. If direct discussion failed, mediation through by the headmen of the guild was possible. If this was of no avail, brewers could also make use of the town's peacemakers (*vredemakers*) to come to an agreement. Naturally, brewers could also make recourse of the judicial system. In seventeenth century Rotterdam and Haarlem, it is apparent from the numerous agreements made between brewers, that this ordinance was enforced by the guild and the town. The regular conflicts between brewers regarding the violation of this law shows that brewers who were owed money by a distributor had strong incentives to see that the law was enforced, just as much as their competitors (or they themselves) had the incentive to ignore the law.[36]

III. The Supply of Capital.

In the 1990s, knowledge on the relationship between Dutch industry and capital markets was such that Leo Noordegraaf could (even rhetorically) pose the questions cited in the introduction to this paper: "Was there even a capital market open to industrial entrepreneurs? Did entrepreneurs want to be dependent on that market?"[37] As was the case in other parts of early modern Europe, Dutch industrial entrepreneurs did indeed have access to a capital market in which they were able to raise long-term lending (which following the definition of modern capital markets, would be markets in which lending for more than a year takes place). Dutch industrialists investing in capital intensive industries typically obtained capital to finance and operate their firms from the same kinds of ways, and from the same kind of sources, that were the norm elsewhere in Europe: their own savings or familial wealth and loans from relatives friends, and acquaintances. While large amounts of capital were raised with mortgages in financing the purchase of a brewery, notes of hand and loans made before notary publics or secured before town officials were also widespread means of raising capital. As was also the case in England and France, this paper shows that institutions securing debt, such as mortgages and loans, and the traditional means of raising capital in early modern Europe, including relying of family networks and partnerships was sufficient to finance the capital needs of large-scale breweries.

Enterprise and Familial Connections

In the case of Holland's brewing industry, capital requirements were significant and formed a barrier to entry to much of the population. The amount of capital invested in small breweries that operated with a capital of say 10,000 guilders were well beyond what most individuals could acquire through saving. Those aspiring to enter the industry would

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[36] In Mathias's study of the British brewing industry, he describes similar provision spelled out by the London brewers. In his analysis, the guild by-laws were a dead letter, in large measure since the Brewing Company carried little weight in the industry.
[37] Noordegraaaf, "Dutch Industry in the Golden Age," p. 144.

either have to borrow large amounts of capital, form a partnership with a wealthy individual, or come from a family with sufficient wealth. Familial wealth and connections were one of the most important sources of capital for entrants into the industry and ownership or particpation in a brewery often occurred as a result of inheritance and was passed down through generations.

Across Holland's towns, most individuals entering the brewing industry had a familial connection to the industry. Familial wealth, know-how, and reputation was important in the world of brewing. This was, for example, the case in the growth of Rotterdam's brewing industry in the early seventeenth century. The involvement of the Pesser and Van Couwenhoven families in brewing in the early seventeenth century examined by Bijlsma are illustrative.[38] In the late sixteenth century, Jan Dammasz. Pesser started the Witten Leeuwen Brewery. When he died, his son Dammas Jansz Pesser succeeded him in he brewery and another son, Dirck Jansz Pesser, started the Zwarte Leeuw Brewery. Dammas Pesser married Maritje Jacobsdr van Couwenhoven, while Dirck Pesser married Haesge Jacobsdr van Couwenhoven, two sisters from a brewing and regent family in Den Briel. In 1621, Jacob Jacobsz van Couwenhoven, a brother of the sisters, started the Twee Klimmende Leeuwen Brewery along the Leuvenhaven. Jacob Jacobsz van Couwenhoven's brother, Eynout Jacobsz purchased the Gele Orangeboom Brewery, which he renamed the Fortuyn Brewery. Willem Allardsz. Van Couwenhoven, their cousin, started the Leeuw met den Staf Brewery. As Bijlsma shows, the Pesser family's ownership in Rottedam breweries continued at mid-century with the next generation of the family.

In other towns, including Amsterdam, Delft, and Haarlem, such familial networks of brewing families was the norm and often extended through generations. The predominance of family networks –through either inheritance or marriage-- in the brewing industry may appear surprising. The role of family networks in pre-modern industries like brewing has recently been analyzed by Peter Mathias. He argues that family networks were common since "the hazards of setting up in business were minimized by following one's father in trade or being introduced into partnership by patrimony. Following in the shoes of one's father, or other relative, directly offered knowledge of the trade, connections with established clients, customers and suppliers, with the confidence and trust that continuity of dealing over earlier years had built up."[39] While gaining technological know-how mattered, Mathias stresses that "gaining access to the insider's world of personal contacts, confidential relationships, personal trust and status in trade" was even more important.[40] Thus, the "[h]igh risk [in the business environment] and the safeguarding of capital, together with the income flows, produced important incentives to consolidate the operation of business with kinship links –and not only over the question of succession."[41]

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[38] R. Bijlsma, "De brouwerij "de Twee Witte Klimmende Leeuwen," pp. 129-30.
[39] Peter Mathias, "Risk, credit and kinship in early modern enterprise" in *The Early Modern Atlantic Economy* edited by John J. McCusker and Kenneth Morgan (Cambridge: Cambridge University Press, 2000), pp. 15-35, p. 17.
[40] Mathias, "Risk, credit," p. 18.
[41] Mathias, "Risk, credit," p. 19.

Aside from following in a family member's footsteps, there were other ways to enter into the industry as well. Some brewers entered brewing from allied trades, typically from the grain trade or from malting. Here expertise and knowledge of the grain market was undoubtedly an important consideration. Other entrants into brewing were wine merchants with detailed knowledge of the beverage industry. Retailers in beer also entered into the production of beer as was the case with Jan Dood who owned a beer wholesaling firm in Amsterdam and bought half of one of Rotterdam's largest breweries in the mid-seventeenth century. So too, on occasion, skilled brew masters who had detailed knowledge of the technical side of brewing entered into brewing as partners (often with borrowed capital) along with wealthy merchants. Later in the eighteenth century, as shown below, salaried clerks, brew masters, etc could also enter into the industry –with small partnership or equity stakes-- and often attain substantial wealth as was the case with the Hooiberg brewery.

Raising Capital: Equity

Partnerships offered important advantages for family members as well as for individuals who were not related: partnerships allowed them to pool their resources and their skills in the pursuit of profit. The precise arrangements made between partners only become clear after the late sixteenth century when the number of company contracts included in the notarial archives grows. Since familial networks reduced risk by training family members in the ins-and-outs of brewing, it is not surprising that partnerships among family members or close relatives was common in many towns throughout the seventeenth and eighteenth centuries. The contracts that were typically made between family members spelled out in varying detail the amount of capital each partner would bring to the table, the degree of control they would exercise over the firm's operations, how much they would be paid for their services, and how the profits would be divided. In some cases, in which not all the partners were actively involved in operating the brewery, the contract specified the degree of control the "sleeping" partner had over the firm's day-to-day operations and its finances. In other words, the contracts governing partnerships sought to address the principle-agent problem that lies at the heart of the governance of the modern corporation.

In the mid-eighteenth century, a small number of large-scale breweries were purchased by partnerships that have attracted attention in the literature. Van Eeghen's study of the Hooiberg industry is the most extensive study of such a partnership.[42] In 1744 the first contract was signed that led to the formation of Pieter Bolton and Company that would exploit the Hooiberg brewery. Peter Bolton, who would direct the company was a brewer who had operated a smaller brewery in Weesp, a town near Amsterdam. He combined together with five other Bolton family members to purchase half the brewery, while the other half was bought by four other merchants, including the wine merchant Michiel Bruyningh who owned one-quarter of the firm. The total capital invested in the

[42] I. H. van Eeghen, "De Brouwerij de Hooiberg," *Jaarboek van het Genootschap Amstelodamum* 58 (1958) 46-97.

firm amounted to 153,163 guilders. For Peter Bolton, who owned 13/64 ths of the firm, the formation of the company meant that he could brew at a scale that would not have been possible otherwise.

In the following decades the firm's capital increased, largely through retained earnings. In 1745 the initial capital was reduced to 150,640:15:8 guilders, where it would stand until 1752 when the firm's capital was increased to 180,000 guilders. In 1754, the firm's capital was again increased with more than 32,000 guilders from "overwinst" (excess profit). With some fluctuations in additional capital investment from profits, including some disbursements, the firm's capital stood at 202,454:2:0 guilders in 1781. A calculation from that year shows that the firm's capital shows that the firm's partners had reinvested more than 32,454:2:0 guilders in the firm from retained earnings (taking the firm's capitalization at 170,000 guilders in 1752 as its base). The total profit on top of the additional capitalization between 1746 and 1781 amounted to 718,529:12:4 guilders, or an annual average profit of 20,300 guilders. This amounts to an average profit of 8.4% per year.

After Peter Bolton died in 1757, the firm was not taken over by his brother as originally intended, but by Nicolaas van Dijk. Van Dijk started with the firm in 1744 as an 'onderdirecteur' and bookkeeper of the company. In 1754, he purchased 1/32 of the company, in part so that he could join the Amsterdam Brewer's Confraternity, for which he needed to own a share in the company. The contracts that he signed with the company include a broad range of incentives for his performance. If the firm's profits were above 8,500 guilders, he would earn an additional 3 percent of the profit. So too, there were incentives to brew more beer, since Van Dijk received 2 stuivers for every mud of spent grain that had been used to brew. Detailing the other arrangements that were made between the directors of the brewery and the firm's managers is beyond the aims of this paper. The evidence for the Hooiberg, however, shows that extended partnerships in the late eighteenth century were used to capitalize firms and govern the relation between the partners and the managers who ran the firm.

While partnerships were often used to capitalize breweries, it was not the case per se that capital requirements in Holland's brewing industry exceeded that which wealthy merchants and bankers could finance. This was the case with the purchase of the Drie Roscammen en het Hoefyser Brewery in Amsterdam that was purchased by the wealthy banker Theodorus de Smeth in the mid-eighteenth century. After his death, the brewery was established as a company that was capitalized at 240,000 guilders with 24 shares of 10,000 guilders, 17 of which were held by the family.[43]

Raising capital: mortgages and loans

As a rule, most breweries that were purchased were not fully financed by the brewer or equity. Typically those by breweries, including many partnerships, relied on the credit market to finance the purchase of the brewery. Long-standing institutions that worked to secure loans were critical for brewers, just as they were for businesses more

[43] Yntema, Brewing Industry, p. 215.

generally, including mortgages and various kinds of secured loans that provided increased certainty that the lender could recoup a part of the loan if it was not paid. For those starting up in the industry, the mortgage market was the single most important means of acquiring access to long-term capital and was typically used to finance the purchase of the structure and the fixed equipment. Other needs for working capital were typically secured by promissory notes, which would be secured on property if there was equity. Once a brewery was profitable, the plow-back of profit into the firm was central in building up equity and in financing any expansion of the firm.

Most entrants into the brewing industry who did not inherit a brewery made use of the mortgage market to finance at least a part of the purchase of the brewery. The mortgage market that developed in Holland during the Middle Ages was arguably the most secure and best organized market for securing industrial capital, including in brewing.[44] The sale of real estate was carefully regulated. The sale of all real estate in the Republic, including breweries, was registered before town officials. In addition to recording the names of the sellers and the buyers, the registry recorded the price, the terms and conditions under which the property was sold, and its location.[45] Since the scale of fixed capital investment was substantial, the ability to raise capital in this way was important.[46]

As above examples show, long-term fixed capital investment in structures in brewing was considerable and much of this was financed with a mortgage. When Otto Selkert sold the half of the 'Witte Paart' brewery to Vincent Bouwensz in 1646 for 52, 445 guilders and 17 stuivers, Bouwensz paid 22,445 guilders in cash and signed a note for the remaining 30,000 guilders over which he paid 5 percent interest. When Abraham de Back sold his brewery 'de Twee Klimmende Leeuwen' in Rotterdam for 55,000 guilders, the new owner, François de Monchy paid 7,000 guilders cash and paid for the rest with 48,000 guilders in *schuldebrieven*, over which he paid 1,950 in interest. The *schuldebrieven* were passed before town officials and were secured on the real estate that had been transferred.[47] Like other brewers, De Monchy may have aimed to pay off the mortgage with his earnings and build up his equity. Yet, it was often the case that mortgages were not paid off quickly, but that brewers continued to pay interest over the unpaid principle for an extended period.

The transfer of a brewery between relatives also typically made use of the institutions that protected the interests of the seller. This was the case when Nicolaas Noppen sold the buildings of the Hooiberg brewery to his brother Peter Noppen for 32,000 guilders in 1725.[48] Peter signed a *schuldebekentenis* before the town's *schepenen* to pay principle in three terms over 18 months. Later, he signed a note that he owed his brother 29,000 for the brewery's equipment. In both cases, the sales contract specified that if Peter

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[44] Yntema, "The Brewing Industry in Holland," pp. 210-11.

[45] In addition to securing the property rights of the owners and those who held a secured claim on the property, the registration of the sale of property also provided the means for the town governments to effectively tax the real estate market.

[46] Brewers with equity could also raise loans secured by their brewery or equipment.

[47] R. Bijlsma, De brouwerij "de Twee Witte Klimmende Leeuwen" in *Rotterdamsch Jaarboekje*, vol 9, 1911, pp. 126-138.

[48] Van Eeghen, "Hooiberg," p. 58

failed to make the agreed upon payments, he would instead pay three percent interest over the principle on the loans.[49] And, since he did not pay any of the principle on the loan, this is in fact what happened.

In the case of the Hooiberg brewery in Amsterdam, the important role played by loans made by family members to purchase the brewery and to finance it subsequently is clear. Theodorus Fries's in-laws lent him 60,000 guilders to purchase the brewery. His mother-in-law, Cornelia Block, lent him 30,000 guilders, her sister Sara Block lent him 15,000 guilders, while his two brothers-in-law each lent him 15,000 guilders. Fries's in-laws required that he pass *schuldbekentenissen* before Amsterdam's *schepenen* for security on the loan, which alone cost 1,650 guilders. As Van Eeghen noted, the family must have been somewhat uneasy about his earlier bankruptcy in which he owed his creditors (including family members) more than 274,000 guilders and wound up paying less than 10% on the guilder to his creditors. Consequently, for the brewery the *schuldebekentinis* explicitly stated "dat alle schuldbekenissen tegelijk waren gepaseerd en zonder intermissie geregistreerd, zodat zij gelijk recht van preferentie hadden."[50]

After a costly refurbishing of the brewery, Fries ran into financial difficulties in the following years. He continued to borrow money from his wife and in-laws. He also borrowed money from the Baptist circle he was a part of. Together with his wife, he borrowed 18,000 from another brewer, Cornelis van Liesvelt, in 1737. This was followed by two more loans of 5,000 from van Liesvelt in 1738 and 1739. In addition to these and other loans, Fries also owed the grain merchant Dirk Hasselaar, who was also a member of the Doopsgezind circle, close to 50,000 guilders for grain. When Fries went bankrupt, he owed his creditors more than 225,000 guilders.[51] He owed more than half of this amount to his wife (40,000 guilders) and his mother-in-law and her sister (86,665 guilders), illustrating again the important role played by family connections in financing brewing.

The practice of taking out loans from friends and relatives was also common as shown in a number of probate inventories. The extent to which this was done and the duration of such loans, however, is not clear. The notarial archives also include numerous instances in which brewers signed notes for loans before notaries. While in some cases it is clear that short-term trade credit was transformed into a longer-term loan, in other cases this was not the case. Yet, given the lack of business records, it is difficult to judge from the incidental loans that are recorded how common the smaller loan amounts of perhaps several thousand guilders were and to what end they were used by the brewers.

Renting a brewery

Renting a brewery from a landlord was another common means of gaining access to the fixed capital needed to enter the industry. The owners of breweries had a number of incentives to rent out the brewery depending on the specific economic situation they faced.

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[49] Van Eeghen, "Hooiberg," p. 58.
[50] Van Eeghen, "Hooiberg," p. 59.
[51] Van Eeghen, "Hooiberg," pp. 61-4. Those whose debts were secured on the brewery and its inventory received the most compensation. Those with unsecured debts, however, such as Hasselaar and others went empty handed.

In years when the market or economy was depressed, the sale of the brewery may have entailed a loss since it may have been difficult to liquidate the property at a favorable price. So too, in a brewery with a good reputation, we can assume that the owner of the brewery could capture a part of the good will that the brewery's name entailed for the business. While not everyone who rented a brewery was a new entrant into the industry, renting offered new entrants some advantages. Foremost, the total outlay of entering into the industry required less credit than buying a brewery.

Rental contracts for breweries were common in Holland's towns. Typically they specified that the renter would be responsible for wear and tear on the equipment. Taxations of the equipment were made at the beginning as well as at the end of the rental period; so that the renter could obtain the value of any improvements he made or pay the difference for the wear and tear. The rental contracts almost always specified a guarantor of the rental price. Clearly those renting the brewery sought to reduce their risk, since there was always the case of default. This was especially the case if the brewer or firm had little capital and sought to insert themselves into the web of credit from suppliers to finance their trade. The aim was to live from trade credit extended by others, and to get paid for beer deliveries as soon as possible. In an industry like brewing where cash sales were common, this presented the main possibility to make money and for the firm to grow. Yet, here much must have depended on economic circumstances. In a period of economic growth this was much easier to accomplish than in an economic slump.

While rental may have been often associated with entry into the industry, or a means of "capital-saving" as is argued in the literature, this need not always have been the case. In other cases, brewers must have judged that the location and attributes of a brewery offered for rent presented the best prospects for making money, that is, renting was superior to direct ownership. For instance, Caspar Heytsick had been a beer brewer in Amsterdam for over 13 years when he rented the Hooiberg Brewery from Timon Veeneman for 4,000 guilders a year in 1663. Heytsick prospered. He amassed enough capital that he was able to buy another brewery in Amsterdam, the Amsterdamse Wapen, in 1675 for his son Hermanus Heytsick for 22,970 guilders.[52]

IV. Conclusion

Brewing in early modern Holland required capital and, by contemporary standards, substantial amounts of it. In contrast to many other industries, including proto-industrial production and crafts, fixed capital investment in structures and equipment was large, and well beyond what most of the population could self-finance. Competition in the industry compelled brewers to brew at a large scale, and increase fixed and circulating capital investment to secure lower per unit costs. The competition among brewers in towns like Haarlem and Rotterdam led them to develop extensive networks of distributors, many of whom were financially tied to the brewery. The preponderance of the ratio of circulating

[52] The son, Harmanus Heytsick, eventually paid of his parents the debt they had contracted for the brewery in 1697. Van Eeghen, "Hooiberg," p. 53-4.

capital in these firms contrasts with the preponderance of fixed capital investment in Amsterdam in the eighteenth century. The difference in the ratio of fixed to circulating capital was not due to differences in production technology, but to differences in market conditions and the reliance on 'export' markets.

As shown in this paper, trade credit was essential to the operation of the brewing industry. Credit from suppliers and to customers was the lifeblood of the firm. In this credit based economy, brewers need to pay particular attention to balancing their debts and credits and maintaining adequate liquidity through access to credit and cash reserves. As competition between brewers and technological change drove the growth in the output of firms in 'export' oriented towns, the development of the tied trade and the extension of credit became more important for the firm. Yet, this posed risks to the brewer. Asymmetries in information between brewers and wholesalers coupled with competition between brewers for market share created the situation in which brewers faced the increased risk of not being able to recover credits extended to wholesalers. This led to the establishment and enforcement of rules ordering the transfer of debts by owed by wholesalers between brewers to limit risk of default.

Finally, this paper shows that capital markets played an important role in financing Dutch industry. The early modern capital market met the same need as modern capital markets: it connected individuals with savings with individuals who needed to borrow money. While many modern institutions that facilitate this were lacking in the Dutch Republic, early modern institutions were well-defined and the capital and financial markets were well-regulated. Institutions regulating the mortgage market, securing promissory notes, and enforcing property rights, including the repayment of debts, played a critical role. That investment in industry posed no difficulty in the Dutch economy is not surprising as shown by its system of public debt, the establishment of the Dutch East India Company, and dominant role in international finance in the late eighteenth century.

The capital requirements and structure of the brewing may be an exception, but is important for what it tells us about the accomplishments of early modern industrialists. While looking backward from the modern perspective the institutions and intermediaries used to raise capital may seem rudimentary and underdeveloped, it must be kept in mind that the levels of capitalization achieved by leading breweries in the seventeenth and eighteenth century were impressive well into the nineteenth century. While the largest breweries in Holland were capitalized in excess of 200,000 guilders in the eighteenth century, in the early nineteenth century Holland's largest breweries had less than 100,000 guilders in capital.