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THE FINANCIAL DEVELOPMENT OF LONDON IN THE 17TH CENTURY REVISITED: A VIEW FROM THE ACCOUNTS OF THE CORPORATION OF LONDON

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ECONOMIC HISTORY

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Abstract

We study an overlooked episode of financial development in England during the 17th century. We construct a novel, annual series of interest rates paid by the Corporation of London. We show that: interest rates declined by 350 basis points; Interest rates co-moved with Amsterdam: we attribute half of this decline to the integration of the capital markets of London and Amsterdam and half to the increase in London's financial market liquidity. The reduction of the usury rate lowered interest rates by 50 basis points in the 1650s. England's financial evolution and path towards modern growth date, therefore, to the 17th century.

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The Financial Development of London in the 17th Century Revisited: A View from the Accounts of the Corporation of London

Nathan Sussman[*][†]

We study an overlooked episode of financial development in England during the 17th century. We construct a novel, annual series of interest rates paid by the Corporation of London. We show that: interest rates declined by 350 basis points; Interest rates co-moved with Amsterdam: we attribute half of this decline to the integration of the capital markets of London and Amsterdam and half to the increase in London's financial market liquidity. The reduction of the usury rate lowered interest rates by 50 basis points in the 1650s. England's financial evolution and path towards modern growth date, therefore, to the 17th century.

Keywords: Interest rate, Financial Development, Financial Intermediation, Growth, Usury, England.

JEL codes: N2, N23, O16, O43, G23.

Introduction

The relationship between financial development and economic growth was extensively researched before the onset of the global financial crisis in 2007. In an environment of rapid historical and recent financial globalization and deregulation,[1] numerous scholars, from earlier pioneers such Bagehot (1873), Schumpeter (1934)[2] and Goldsmith (1969), through summaries of the theoretical and empirical findings by Levine (2005), demonstrated the link between financial development and growth. After the GFC attention naturally shifted to the risks involved in financial development (e.g., Reinhart and Rogoff 2009; Schularick and Taylor 2012) leading economists to argue that perhaps there is too much finance (Arcand et al. 2015).[3]

In this paper, we turn to an overlooked aspect of financial development in England during the 17th century, when financial development was still in its infancy.[4] We extracted individual debt contracts from the accounts of the Corporation of London to construct a novel, annual series of interest rates paid by the Corporation to its lenders from 1638 to 1683.[5] The data show, *Figure 1*, that from the 1630s to the 1680s interest rates in London declined in parallel to those in Amsterdam, the most developed financial center of the time (Carlos and Neal, 2011). They reached 4% in 1680. We show, **Figure 2**, that the decline in interest rates is strongly correlated with increases in real GDP per capita and real GDP per capita growth. The picture that emerges is one of a close association between financial development as measured by declining interest rates and economic growth (Levine 2005).

Most of the research in economic and financial history has focused on the development of financial markets in England after the Glorious Revolution in 1688. Earlier accounts already disputed the starting date of the financial revolution in England. Dickson's (1967) "The Financial revolution…1688-1756" was followed by Roseveare's (1991) "The Financial Revolution, 1660-1760." However, North and Weingast (1989), a highly influential paper, argued that institutional

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[1] For comparison of historical and recent globalization, see Bordo et al. (2007) and Kose et al. (2009).
[2] The original published in German in 1911.
[3] See Arcand et al. (2015) for a thorough discussion of the growth and development literature.
[4] The early history of the financial intermediation by the Corporation of London was studied by Ashton (1960) who mainly looked at the forced loans imposed on the Corporation before the Civil War. Carlton (1974) studied the Corporation of London's orphan's fund, which we analyze in (Coffman et al. 2019).
[5] We also extracted a shorter and incomplete series of interest rates paid by borrowers from the Corporation from 1616 to 1639, see section 1.2.

reforms, namely establishing credible commitment, enacted after the Glorious Revolution contributed to financial development and growth. Some of the key financial innovations were: the establishment of the Bank of England (1694), a stock-exchange and a deep market for perpetual government securities. The main criteria they used for the successful financial transformation and its most important contribution to economic growth was evidence of declining interest rates.

Figure 1
Borrowing cost of the Corporation of London and Province of Holland:1638-1683
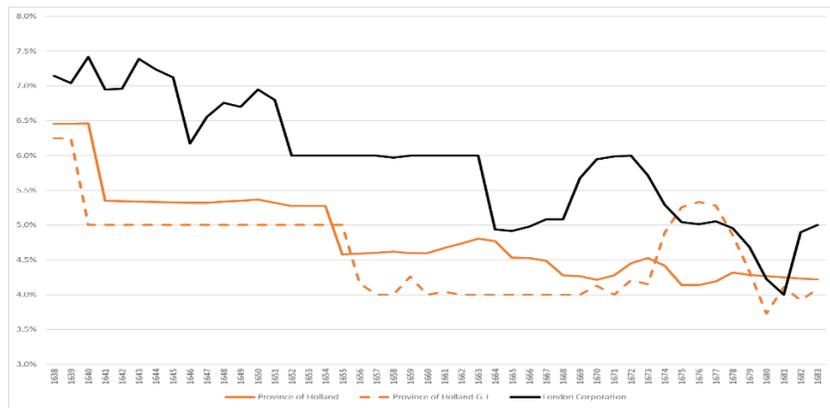
Sources: London: COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-017. Borrowing rates weighted by loan amount.
Province of Holland: average cost of debt from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795
Province of Holland G-J: market prices communicated by Gelderbloom and Joonker.

Figure 2
Corporation of London Borrowing rates and GDP per capita: 1638-1683
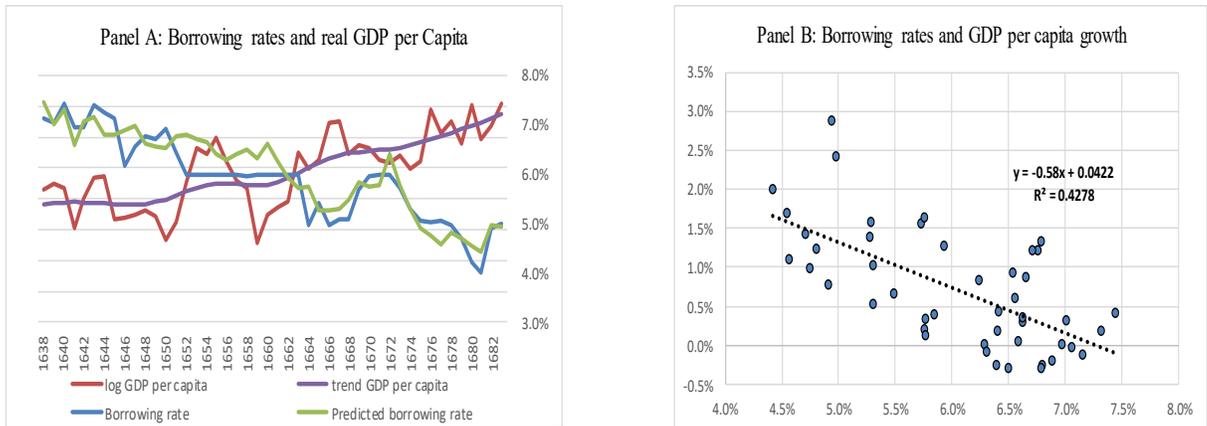
Sources: London: Corporation of London COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-017. Borrowing rates weighted by loan amount. Predicted borrowing rates from *Table 2* column (3). Real GDP from Broadberry et al. (2011). The population of England from Clark (2010).

The North and Weingast hypothesis sparked an ongoing debate on facts and explanations. Clark (1996) showed that real interest rates measured as the return to capital were not affected. Sussman and Yafeh (2006) showed that interest rates increased for more than three decades after the Glorious Revolution. Recent research has offered a more nuanced view of the Glorious Revolution's impact on financial development and economic growth.[8] Recent research on the effect of the Glorious Revolution emphasizes the change in the ability of the state to rule efficiently and raise taxes to finance wars and debt (e.g.: (O'Brien 2011); (Cox 2012); (Pincus & Robinson 2014)). Another strand of the literature emphasizes the effects of partisan politics and the growth-enhancing economic policies of the Whig party (e.g.: (Stasavage 2007); (Pincus & Robinson 2014)).

Recent research argues that the Glorious revolution allowed parliament to effectively allow for the transfer of landed property rights that led to a more efficient allocation of resources and the development of capital markets (e.g., (Bogart 2011); (Bogart & Richardson 2011); (Hodgson 2017); (Dimitruk 2018)). The emphasis that the Glorious Revolution was a watershed in the development of efficient (capital) markets fits nicely with research that claims that Britain's (legal) institutions were more conducive to the development of efficient financial markets (e.g., [9] ; Glaeser and Shleifer 2002) and the large empirical literature that followed (La Porta, et al. 2008).

Economic historians also highlighted the unique origins of Britain's market-based financial system. Munro (2003) argued that financial development in the continent was based on banks and municipal bonds. In contrast, England lacked such institutions. From medieval times, its merchants developed a financial system around markets that cleared of bills of exchange. Carlos and Neal (2011) argue that Britain's financial supremacy emerged after the Glorious Revolution. They claim that its foundations developed in the 17th century. Whereas Amsterdam relied on banks and central clearing, London relied on a decentralized exchange. An important evolution of markets was the trading of East India Company shares.

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[8] For the sake of not repeating the extensive arguments raised in this debate, I refer the reader to excellent summaries of the debate in Cox (2012); Coffman et al. (2012), in particular Coffman (2012) ; Pincus and Robinson (2014); Hodgson (2017); Dimitruk (2018).
[9] e.g., (Porta et al. 1998)

The main goal of this paper is to present new evidence on financial development, which is consistent with the evolutionary hypothesis of the beginning of modern British economic growth ((Broadberry et al. 2011). We focus on the provision and analysis of the new interest rate data we extracted from archival records. This paper is part of a larger project by Coffman, Stephenson, and Sussman that analyzes the role of the Corporation of London in the financial development of England in the 17th century. Recent research focused on the role of the 'goldsmith bankers' (Quinn 1997). Our focus on the Corporation of London complements that research to provide a complete account of the financial development of England.

The Corporation of London was a chartered corporation that originated in the 12th century. Its governance structure included the Lord Mayor, the Court of Aldermen (executive branch), and the Court of Common Consent (a deliberative institution).[10] In the 17th century, it enjoyed autonomy and was essentially an oligarchy of wealthy merchants with mainly Whiggish inclinations.[11] The accounts, we studied, reveal that the Corporation of London's financial activities intensified during the 17th century. Ashton (1960) studied its financial importance before the Civil War. Their similar role after the Restoration was recognized by Richards (1929) who characterized its role as a financial intermediary to the crown (similar to the goldsmith-bankers, but on a larger scale). It also administered an orphans' fund that acted as a savings (insurance) for (potential) orphans.[12] Coffman et al. (2019) show that the Corporation undertook and financed the reconstruction of infrastructure and public buildings destroyed by the fire of 1666.

The Corporation of London's financial activities were similar to those of their counterparts on the continent, especially in the Low-Countries. However, historians and economic historians hardly researched its financial activities.[13] Munro (2003) and Carlos and Neal (2011), therefore, arrived at their conclusion on the unique history of financial development in London based on incomplete

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[10] See City of London fact sheet:
https://web.archive.org/web/20130815012629/http://www.cityoflondon.gov.uk/about-the-city/history-and-heritage/mansion-house/Pages/History-of-the-Government-of-the-City-of-London.aspx
[11] See Unwin (1908) and Roseveare (1991).
[12] In particular, see Richards (1929) pp. 107-109. On the Orphans fund, see Carlton (1974). See also
[13] Notable exceptions are (Harding 2003); (Kellett 1958), (Wren 1948); (Wren 1949);.

data. London is, therefore, also missing from the comprehensive analysis by Statsavage (2011) who studied in detail the debt of autonomous cities in Europe.[14]

This paper's main contribution is to provide a novel, annual interest rate series for England before the Glorious Revolution (**Figure *1***) and analyze the determinants of the decline in the cost of borrowing. In doing so, we contribute to the understanding of an earlier episode of British economic growth. Our analysis allows us to arrive at the following conclusions: 1. Non-sovereign interest rates in London declined throughout the 17th century by as much as 350 basis points: 150 basis points until 1663 and additional 200 basis points during the Restoration. 2. Interest rates co-moved with those in Amsterdam. 3. Accumulated wealth and possibly capital inflows made the supply of savings elastic; Our regression analysis suggests that we can attribute roughly 55% of the significant decline in the cost of capital to the integration of the capital markets of London and Amsterdam and the decline of Dutch yields. The increase in the liquidity London's financial market, captured by the size of Corporation's debt, contributed 45% to the decline in interest rates.[15]

Additional interesting findings are: 4. We show that contrary to findings by Temin and Voth (2005) for the early 18th century, the usury rates were usually not binding. Using censored regression analysis, we estimate a 'shadow interest rate' for years when the usury rate was binding. On average, the shadow interest rate was 50 basis points above the usury rate. 5. We provide an estimate for the spread between the secured and unsecured debt of the Corporation. We show that during the financial crisis, of 1672, it reached almost 100 basis points. In normal times it was close to zero. 6. Using a limited number of accounts, we show that wealthy individuals borrowed from the Corporation of London in the 1630s at similar rates that Hoare's bank provided such loans at the beginning of the 18th century.

Our data analysis ended in 1683. In that year the Corporation of London suspended interest payments on its unsecured debt. In Coffman et al. (2019) we suggest that the default was a result of heavier than expected commitments and insufficient cash flows related to the reconstruction of

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[14] See Table 2.1 p. 31. One can argue that London was 'autonomous' but not a 'city-state' and therefore, does not qualify to be included in the analysis.
[15] Based on a model that assumes perfectly elastic capital flows. In the hybrid model that also allows for the supply of savings to affect borrowing rates, the contribution of greater savings is to lower interest rates by 50 basis points (15% of the decline). On the rise of liquidity and the decline in interest rates, see Habakkuk (1952) p. 44.

the infrastructure and public buildings of the City destroyed in the fire of 1666. A few months after the default In October of 1683, the King suspended the privileges of the Corporation of London in what is known as the 'Quo Warranto' act.[16] The privileges were restored in 1688 immediately after the Glorious Revolution. However, the Corporation of London, riddled with debt in default, did not resume its role as a financial intermediary. Subsequent financial development in England proceeded on the well-known and heavily researched trajectory.

The autonomous Corporation of London, like its successful continental counterparts (Stasavage 2011), managed to borrow at a lower cost than its sovereign because it enjoyed greater credibility than the crown. Unlike his grim conclusion that city oligarchies became rentier societies siphoning credit to unproductive uses, the Corporation of London borrowed to the hilt to rebuild a modern city (Coffman et al. 2019), financed the crown and provided social security to its orphans. The declining interest rates we observe in the data were also the manifestation of financial deepening embodied in a rising stock of debt that increased liquidity (Gorton & Pennacchi 1990). More liquid capital markets and lower cost of credit following the Restoration helped propel the English economy forward (**Figure *2*** and Broadberry et al. 2011).

The rest of the paper is organized as follows: Section 1 describes the lending and borrowing by the Corporation of London and presents the interest rate series. In Section 2, we present the methodological framework and the econometric estimation of the cost of borrowing. Section 3 presents the estimation results used to account for the London-Amsterdam spread. Section 4 exploits the censored regression analysis to compute the 'shadow interest rate' during periods when the usury rates were binding. Section 5 provides an analysis of the spread between secured and unsecured debt. Section 6 concludes.

1. Lending, borrowing and interest rates based on the Corporation of London accounts

In this section, we provide a novel, annual series of interest rates for the 17th century. We extracted the data from the accounts of the Corporation of London. The data is comprised mainly of the borrowing accounts of the Corporation of London (1638 to 1683). We supplemented it by short series on lending by the Corporation of London (1616 to 1639). We also present data on amounts

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[16] Roseveare (1991).

borrowed and various characteristics of the market for the Corporation of London's debt. We also show the distribution of loan amounts and loan maturities.[17]

1.1. The Sources

We derive our data from the chamberlain's account books kept at the London Metropolitan Archive. The 'Cash Books' contain the borrowing and lending activities of the chamberlain of the Corporation of London From 1633 until 1648.[18] As was customary in the accounts of the time, borrowing was recorded in the receipts ('charges') section of the account. There was no distinction between an operating budget and a capital account.[19] From 1649 to 1683, the chamberlain kept the detailed financial accounts in a separate ledger – the 'Loan Books.'[20] The Cash Books listed only the totals.

The accounts detail the date of origination of the loan. They provide the name/s of the lender/s; their gender (widows or spinsters); whether they resided outside of the City of London; whether they belonged to the Gentry (gentlemen, esquire, and nobility); whether they belonged to the City government, and whether they were members of the livery companies (usually with specific occupations listed). They also describe the amount lent, the nature of the loan (very short term loan, six months' loan or annuity) and the rate of interest on the loan.

We extracted additional accounting data from the Cash Books. They include annual receipts, expenditures, and balance sheets. The provision of a detailed annual balance sheet, including assets and liabilities, started to appear in the Cash Book in the fiscal year 1654. The fiscal accounts ran from Michaelmas to Michaelmas (29 September). The accounts are complete except for the ledger for the years 1665 to 1667, which was burnt in the fire. The accounts allow calculating the annual operating deficit of the Corporation (excluding borrowing and debt redemptions) and the Corporation's stock of debt and additional financial ratios.

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[17] We provide more details on the lenders and the socio-economic situation in Coffman et al. (2019a).
[18] The Cash Books consulted were: COL/CHD/CT/001 to 019. For an early analysis see (Wren 1949)
[19] For a detailed explanation of the accounting system used by the Chamberlain of the Corporation, see: 'Introduction: Medieval accounts and their arrangement,' in *Chamber Accounts of the Sixteenth Century*, ed. Betty R Masters (London, 1984), pp. ix-xxxii. *British History Online* http://www.british-history.ac.uk/london-record-soc/vol20/ix-xxxii.
[20] The Loan book consulted were: COL/CHD/LA/001, and 002.

1.2. Lending by the Corporation of London

The Cash accounts show that the Corporation of London advanced loans to individuals and companies before 1640. Afterward, the Corporation of London started to borrow from individuals and no longer lent them. Since surviving records began in 1633, we have detailed lending only for 1633 to 1640. We used the stock of unpaid debt borrowed from the Corporation of London to infer, albeit from an incomplete sample, the lending rates before 1633.

1.2.1. The loans

The Corporation of London lent to wealthy individuals and two companies; the East India Company and the company of the Merchant Adventurers of London. The loans were originally extended for 6 or 12 months and were approved by '*consent of the court (of Aldermen)*.' The Corporation made these loans without asking for collateral. The stock of unpaid debt also includes several loans, made in the 1620s, that were in default.[21] These loans were part of the forced loans imposed by the crown on the Corporation in 1616 and, 1625 that were unpaid (Ashton 1960). **Table *1*Table *1*** provides summary statistics for the unsecured lending we extracted from the account books. The average loan totaled about £1000 while the median loan was £650. Depending on various assumptions, £1000 then are worth today between £150,000 to £2,250,000.[22] We offer another perspective by comparing these loans to lending by Hoare's Bank from 1695 to 1724. Temin and Voth (2013) showed that the average loan made by Hoare's was £1040 pounds. This amount was similar to the one we calculated for the Corporation of London. Temin and Voth (2013) report a very unequal loan distribution, with a Gini coefficient of 0.73. However, our data reveal less inequality with a Gini coefficient of 0.43. We can interpret the lower inequality as more equal access to loans than at Hoare's bank.

The accounts of the Corporation of London reveal that it lent to the East India Company and the Company of the Merchant Adventurers. The East India Company borrowed £15,000 a year from 1632 to 1635 and £12,000 in 1636 at 6%. In 1639 it borrowed only £5,500 at 7%. The borrowing by the Company of Merchant Adventurers was more modest than that of the East India Company.

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[21] We infer that the loans were in default from accrued interest charges and the absence of current interest payment.
[22] Calculation based on measuring worth website https://www.measuringworth.com/index.php

It borrowed £2,000 at 6% in 1632 and 1633 and £1,500 at 6.5% in 1634 and 1635. It seems, therefore, that the East India Company enjoyed a better credit rating.

Table 1
Summary statistics of unsecured lending and borrowing by the Corporation of London: 1616-1683

Number of loans	Number of borrowers	Total lent	Mean	Median	Min	Max	Gini
121	115	£ 181,695	£ 969	£ 650	£ 25	£ 4000	0.43
Number of loans	Number of Lenders	Total Borrowed	Mean	Median	Min	Max	
2118	1500	£ 871,474	£ 411.5	£ 200	£ 5	£ 7100	0.55
Loan duration in months							
Number of loans	Amount lent	Weighted mean	Mean	Median	Min	Max	
226	£86,152	53.6	64.1	52.1	2 days	305	

Sources: COL/CHD/CT/001 to 019; COL/CHD/LA/001 and 002.
Loan duration based on a sample from 1662-6 and 1680-3.
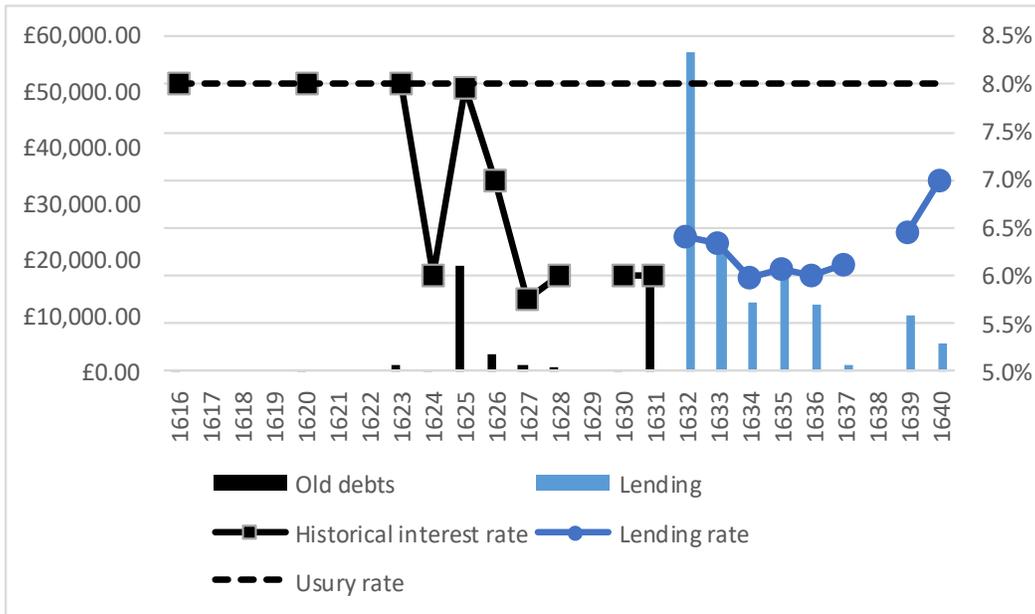
1.2.2. Lending rates

We show the lending rates charged by the Corporation of London and amounts lent in **Figure 3**. We can see that interest rates declined from the usury ceiling of 8% in 1625 to 6% during the 1630s and then increased to 7% in 1640. It is tempting to compare the loans made in the 1630s with those made by Hoare's Bank after the Glorious Revolution. Temin and Voth (2013) report that the usury ceiling of 6% constrained Hoare's lending rates until 1714, and 5% after that. Therefore, they argue that administrative rather than market forces dominated lending rates. Our data show that almost a century *earlier*, equal-sized loans (on average) were advanced at *market* rates. We also show that lending rates in the 1630s were similar to those that prevailed a century later, decades after the Glorious Revolution.

1.3. Borrowing by the Corporation of London

The Corporation of London started borrowing from individuals in 1638. From 1640 it faced borrowing needs as its cash flow, which was positive and allowed to lend, became negative for most years (
Figure 4). From 1639 to 1683, the average annual cash flow, excluding borrowing, was about minus £6,500. In this subsection, we begin by detailing the characteristics of the loans. We then present the interest rates at which the Corporation of London borrowed.
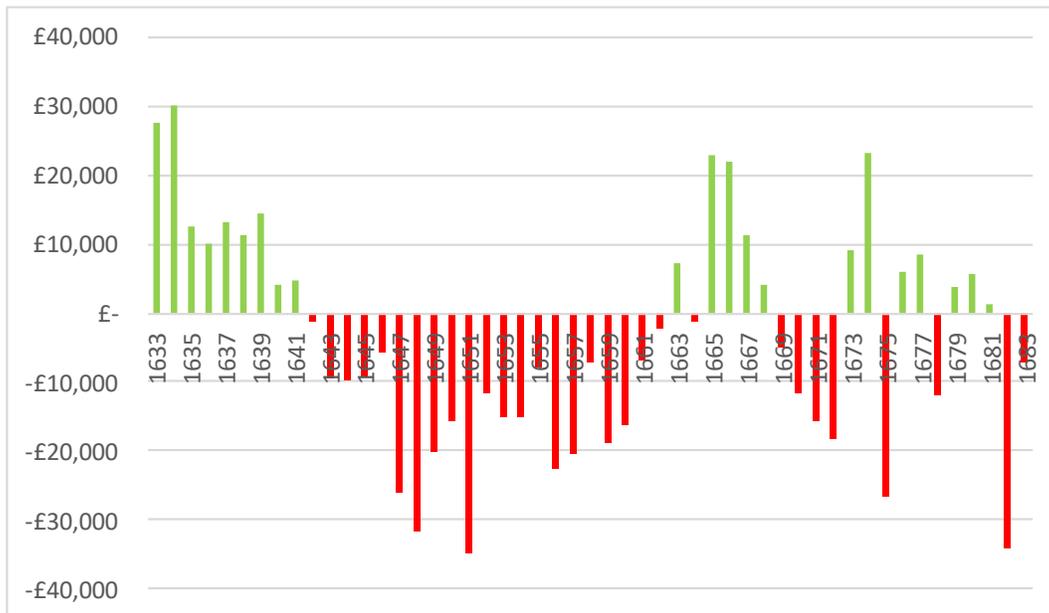
Figure 3
Corporation of London lending: 1616-1640

Sources: COL/CHD/CT/01/001-003.
Old Debts and historical interest rate based on the stock of outstanding debt owed to the city in 1633 (COL/CHD/CT/01/001). Lending and lending rate based on reported actual lending.

Figure 4
The cash flow of Corporation of London: 1633-1683

Sources: COL/CHD/CT/01/001-17.
Cash flow is equal to the cash balance reported in the account minus borrowing.

1.3.1. Borrowing

The Corporation of London borrowed money from individuals to cover its deficits. These loans were secured only by the Corporation's reputation. The accounts record them as "*borrowed for the City's use on the City's bond.*" Habakkuk (1952) cites Benbrigge's *Usura Accommodata* from 1646, claiming that the City's Chamber was a place '*whereunto men may put their moneys, for the assurance whereof, and the payment of its use (which is five in the hundred per annum), they have the security of the Chamber, which is accounted the best this day in England*".[23] In the period from 1638, when borrowing began, to 1662 most of the loans were recorded as borrowed for six months. In effect, most loans were repaid after longer periods. In 1663 the accounts stopped mentioning the duration of the loans altogether.[24] A small number of loans (2% of the total borrowed) were annuities. Less than 1% of the loans were recorded as loans to "*cover the want of cash*" which were repaid within a very short period. For comparison purposes, we also exploit the borrowing for the rebuilding of London after the fire (1671-1677) which was secured by the Coal Tax receipts.[25]

Table 1 Table *1* also provides summary statistics for the unsecured borrowing we extracted from the account books. The accounts record 2118 loans advanced by 1500 wealthy individuals for a total of almost 900 thousand pounds over 40 years. The average loan totaled about £400 while the median loan amounted to £200. These were substantial investments, £200 pounds then are worth today, between £30,000 to £450,000.[26]

Until 1662 the loans were recorded as borrowed for six months but were typically held for longer periods. Later, the loans had no minimum holding period and became even more liquid. Thus, we can characterize them as bonds or deposits with a flexible redemption option making them a liquid investment. It appears that in practice they were not tradable as all the redemptions we sampled were repaid to the original lender, his legal heirs or spouses. We cannot rule out the option of using the bonds as collateral. The loans were contracted at a given interest rate, which in most periods

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[23] Footnote 4 in (Habakkuk 1952) and page 5 in the original.
[24] This is similar to the practice in Holland (Gelderblom & Jonker 2004) and to earlier forms of city finance like *rentes* that can be treated as annuities (Munro 2003).
[25] We analyze in detail the finances of the rebuilding of London in Coffman et al. (2019).
[26] Calculation based on measuring worth website https://www.measuringworth.com/index.php

varied between lenders. During their holding period, the bonds were subject to variable interest rates, based on prevailing borrowing costs.

We sampled two periods, 1664-1668 and 1680-1683, and constructed the actual duration of the bonds held by the individuals. In both periods, the median holding period was about 52 months (**Table *1***). Ten percent of the loans were held for less than six months, and 10 percent of the loans were held for more than ten years. Loan redemption was either by full payment of the principal (62% of loans sampled) or in installments (38% of loans sampled). **Figure *5*** shows the distribution of the holding periods. The figure shows a large concentration of loans held for periods less than five years and a long tail of loans held for longer durations.

Figure 5
Distribution of maturity of borrowing by the Corporation of London: 1664-8 and 1680-3
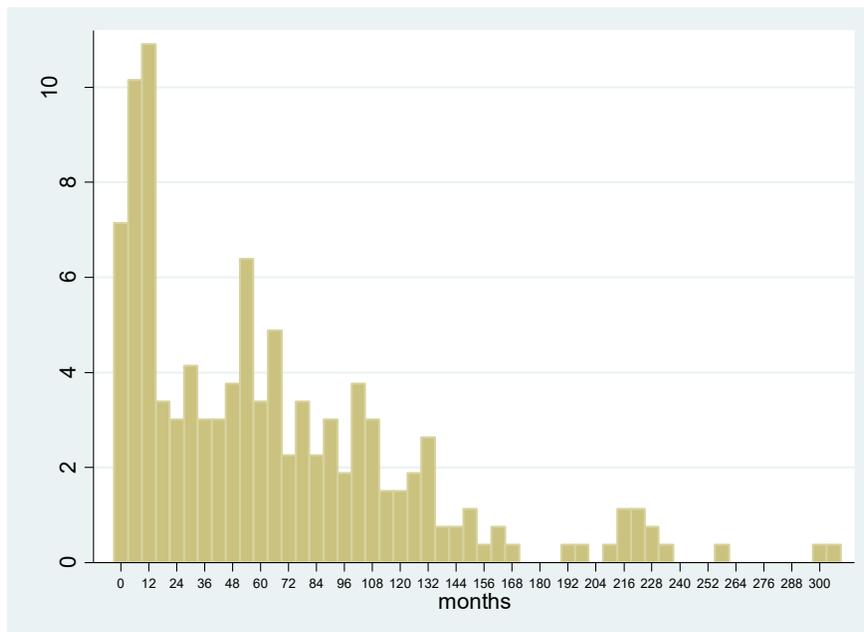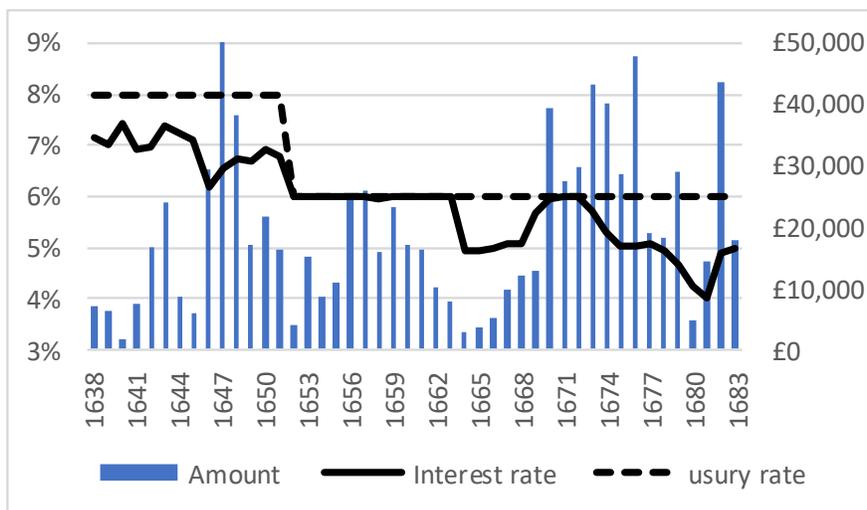

Sources: COL/CHD/LA/01/001, and 002.

1.3.2. Borrowing interest rates

The data extracted from the loans recorded in the accounts allow us to construct a time series of borrowing rates for the Corporation of London. We report annual borrowing rates calculated using a weighted average of the borrowing rates on all bonds. In **Figure *6***, we plot the weighted borrowing rate together with the amounts borrowed. One can note a clear downward trend in the interest rate series. From the 1640 to 1680 borrowing rates declined by 350 basis points to 4%.

Interest rates show a declining trend in before the Civil War and in 1651 reached 6% for some loans. In 1651 the Commonwealth Parliament lowered the usury rate from 8% to 6%. Charles II reaffirmed the act after the Restoration in 1661.

Figure 6
Borrowing by the Corporation of London: 1638-1683

It is likely that during Cromwell's protectorate and the initial years of the Restoration, the usury rate was a binding constraint on borrowing rates (Munro 2003). Beginning in 1664, we observe a decline of interest rates towards 5% (in 1665). The rebuilding of London after the Fire and the outbreak of the Third Anglo-Dutch War placed large demands on the capital market and by 1672 rates reached 6% again. However, the peak was short-lived and already in 1673 rates started their rapid descent and reached 4% by 1681. In 1682, when the Corporation of London borrowed heavily to avert default, rates increased to 5%. Our series ends in 1683 when the City defaulted on its debt services and stopped borrowing.

It is noteworthy that in January 1672, Charles II stopped paying interest on loans he raised mainly to finance the fleet (Horsefield 1982). The infamous 'Stop of the Exchequer' lasted throughout the 1670s. The debts of the King to the bankers were capitalized at 6% (Li 2019). At the same time, unsecured borrowing by the Corporation of London was financed at some 200 basis points *less* than the sovereign debt. Following Quinn (2001), in the short run, the king's default probably

resulted in a substitution effect in financial markets that increased the supply of funding available for safer borrowers like the Corporation of London.

The decline of borrowing rates, especially after 1660, supports Roseveare's (1991) claims that the Restoration marked the beginning of the Financial Revolution in England. During the reign of Charles II, interest rates on the debt of the Corporation of London further declined by 200 basis points to reach 4%. The rate of 4% would be reached again only in the 1720s and remained the average Consol yield in the 18th century (Sussman & Yafeh 2006). These findings offer further evidence that the effect of the Glorious Revolution on borrowing costs was not as large as claimed by North and Weingast (1989).

2. The determinants of the cost of borrowing

In this section, we estimate the determinants of the cost of capital to the Corporation of London to account for their decline. We begin by presenting the empirical framework that we use to test econometrically for the determinants of the cost of capital. We then present and discuss the results of the estimations.

2.1. Empirical framework

In perfect and competitive capital markets, a borrower faces a perfectly elastic supply of capital. Therefore, the cost of borrowing of a particular borrower i_t, is equal to the time-varying risk-free rate r_t plus a time-varying risk premium α_t, and a time-varying liquidity premium l_t.[27]

$$(1)\ i_t = r_t + \alpha_t$$

One departure from the assumption of perfect capital markets is that the borrower is large enough that the supply of funds is not perfectly elastic and depends on the availability of savings (income or wealth, (Quinn 2001)). We assume that the demand for loans by the Corporation of London was dictated by its deficit, D_t and the lending to the corporation was a function of income, Y_t, and the interest rate, i_t. The equilibrium interest rate for the Corporation of London is:

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[27] We abstract from other premia such as the cost of moving capital between Amsterdam and London.

$$(2)\ i_t = f(D_t, Y_t)$$

Finally, the market for loans was affected by usury laws. We can characterize it by credit rationing (Pincus & Robinson 2011). We, therefore, follow Temin and Voth (2008) and test for the impact of the usury law on the borrowing rate paid by the Corporation of London.

The equation for estimation under the assumption that the Corporation of London was a 'small' borrower (equation (1)), and faced an elastic supply of capital is:[28]

$$(3)\ i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + u_t$$

Following Sussman Yafeh (2006), we assume that Amsterdam is the European financial center and considered the debt of the government of the province of Holland as the risk-free asset of the time. The yield on its debt is therefore r_t ((Gelderblom et al., 2016).[29] **Figure *1* Error! Reference source not found.** plots the weighted borrowing rate and two measures of the cost of capital for the province of Holland. The first, based on Gelderblom et al. (2016), is the tax-free market yields of the provinces' debt and the second, based on the average cost of capital from the financial accounts of the Province of Holland (Fritschy 2017). Fritschy used a similar measure of the costs of capital as in Sussman and Yafeh (2006) and divided interest payments by the stock of debt outstanding. The co-movement of the yield series can be readily seen in **Figure *1*.**[30] Formally, because the yield series have a unit root, we tested them for cointegration and could not reject the hypothesis that they are cointegrated.

To account for the time-varying risk premium of the Corporation of London, we introduced a set of dummy variables that capture England specific events. The English civil war: 1642 to 1648; the Protectorate: 1649 to 1659; The year of the Restoration (1660); The Stop of the Exchequer, 1672, when King Charles II defaulted on the interest payments of the government's debt and the Third Anglo-Dutch war: 1672-1673. We also calculate some financial ratios related to the fiscal borrower risk of the Corporation of London: i. The budget deficit, ii. The debt to income ratio

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[28] The historical literature, Grassby (1969) and Habakkuk (1952) claim that the supply of funds to the Corporation of London was indeed elastic.

[29] An alternative is to use the rental rate of return on land as the risk-free rate of return. However, the real rate of return calculated by Clark (2010) is stationary and therefore not cointegrated with the Corporation of London borrowing rate.

[30] In the econometric analysis, we ended up using Fritschy's cost of capital estimate that was statistically more significant.

(leverage), iii. The debt service to income ratio, iv. The current ratio – cash reserves to current liabilities.[31]

Finally, we use the outstanding stock debt of the Corporation of London as a measure of its liquidity. The literature on corporate debt assumes and has validated empirically that the larger is the issue of the debt, the more liquid it is (Houweling et al. 2005). Habakkuk (1952) and Keirn and Melton (1990) attribute part of the decline in interest rates in London in the 17th century to the increased liquidity of the Corporation of London's debt. Ventura and Voth (2015) argue that rising public debts in England in the 18th century had not only crowding out effects but also increased the liquidity of debt assets that crowded in financial investment from more traditional (e.g., land) investments.

We base our second equation for estimation on the assumption that the Corporation of London did not face a perfectly elastic supply of funds (equation (2)). We assume that the quasi-exogenous demand for loans is a function of the structural deficit D_t and that the supply of loans has the following log-linear representation:

$$L_t^S = ai_t + bY_t$$

In equilibrium:
$$L_t^S = ai_t + bY_t = D_t$$

The equation for estimation is

$$(4)\ i_t = c + \theta D_t + \mu Y_{t-1} + u_t$$

Where D_t is the Corporation of London's structural operating deficit. We define the deficit as the non-financial revenues minus non-financial costs.[32] The supply of savings is proxied by the log of the real GDP series we take from Broadberry et al. (2011). Because of potential endogeneity issues, we estimate the equation using the lagged log real GDP Y_{t-1} . $\theta = 1/a$ and $\mu = -b/a$.

We also estimate a hybrid model that includes elements from both equations:

$$(5)\ i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + \theta D_t + \mu Y_{t-1} + u_t$$

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[31] As we saw above, the average duration of the loans contracted by the Corporation of London was about four years, we calculate the current ratio as the cash reserves divided by a quarter of the debt.

[32] COL/CHD/CT/01/001-0017. The accounts where a cash flow account and therefore, did not distinguish between the operating budget and the financial operations when calculating the account balance. Borrowing was recorded as cash inflow (charge) and debt repayment as a cash outflow (discharge).

The cost of borrowing by the Corporation of London seems to have been constrained by the usury law of 1651 (**Figure *6***). Because for some years, we believe that our outcome variable, the cost of borrowing is censored, we estimated equations (3) to (5) using censored regressions. For robustness, we also test for the effect of the usury laws by estimating a standard OLS regression and include a dummy variable for the usury law of 1651 as in Temin and Voth (2008).

2.2. Results

We estimated the cost of borrowing for the Corporation of London using equations (3) to (5). Our results (**Table *2***, columns (1) to (3)) show that the borrowing rates of the Corporation of London co-moved with the Dutch rates. This result suggests that the London and Amsterdam capital markets were interconnected.[33] The specification based on equation (3) that assumes an elastic supply of funds, shows that the liquidity premium declined when the stock of debt increased. Given the coefficient, the almost doubling of the stock of debt towards 1683 reduced borrowing rates by as much as 70 basis points.[34] Introducing variables that account for variable risk premium shows that only the Third Anglo-Dutch War (1672-4) significantly increased borrowing rates by as much as 70 basis points. Of the financial ratios that we could use as indicators for the financial solvency of the corporation, only the current ratio – the ratio of cash reserves to liabilities significantly affected the borrowing cost of the Corporation of London. For example, the deterioration of the financial situation of the Corporation of London in 1682 accounts for an increase of 45 basis points in the borrowing rate in that year (**Figure 7**).

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[33] We tested for unit-root in the variables used in our estimations. As mentioned above, the borrowing rate of the Corporation of London and the Dutch interest rates have a unit root. The stock of debt and real GDP also have a unit root. We checked for cointegration using the Johansen method and cannot reject the hypothesis of a single cointegrating equation. Because of the usury laws, we are interested in a censored regression estimation, and therefore, after verifying cointegration, we proceeded with the censored estimation.

[34] This finding supports the qualitative claims by Habakkuk (1952) and (Grassby 1969).

Table 2
Corporation of London borrowing cost: 1638–1683

Equation	(1) $(3)\ i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + u_t$	(2) $(4)\ i_t = c + \theta D_t + \mu Y_{t-1} + u_t$	(3) $(5)\ i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + \theta D_t + \mu Y_{t-1} + u_t$	(4) REF _Ref13749428 \h * MERGEFORMAT ($it = c + \beta rt + \gamma i \alpha it + \delta l$
r_t	0.640*** (6.87)		0.498*** (4.43)	0.217 (1.54)
l_t	-0.032*** (-3.75)		-0.025** (-2.38)	-0.025*** (-2.61)
D_t	-0.034 (-0.59)	0.126 (1.64)	-0.020 (-0.36)	-0.036 (-0.69)
Leverage	0.001 (0.03)		-0.001 (-0.37)	-0.001 (0.19)
current ratio	-0.0102*** (-3.16)		-0.010*** (-3.20)	-0.008** (-2.88)
Y_{t-1}		-0.058*** (-7.49)	-0.0142 (-1.44)	-0.005 (-0.69)
civil war	0.002 (1.06)		0.001 (0.19)	-0.002 (-0.75)
Parliament	-0.001 (-0.02)		-0.001 (-0.06)	-0.002 (-0.86)
Fire	-0.004 (-1.48)		-0.003 (-1.34)	-0.003 (-1.37)
Anglo-Dutch War	0.006*** (4.36)		0.005*** (4.06)	0.005*** (3.45)
Usury				-0.008** (-2.87)
N	45	45	45	45
McKelvey & Zavoina's R^2	0.87	0.63	0.88	0.88
Cox-Snell R^2	0.83	0.57	0.84	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Corporation of London borrowing costs, i_t; log outstanding debt, l_t; *deficit*, D_t; *leverage*, and *current ratio* from LMA: COL/CHD/CT/01/002-017. Province of Holland average cost of debt, r_t, from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795. Lagged log real GDP, Y_{t-1}, from Broadberry et al. (2011). Dummy variables equal 1 for civil war (1642-9); rule by Parliament (1650-59); London fire (1666); Third Anglo-Dutch War (1672-4).
Regressions (1) - (3) were estimated using *cnreg* in Stata with robust standard errors.

The alternative specification that assumes that the borrowing rate for the Corporation of London is determined in an imperfect capital market with an upward-sloping supply curve for funds (equation (4)) is shown in column (2) of **Table 2**. The results show that while the sign of the coefficient of the demand for loans (the Corporation of London deficit) is positive, it is statistically insignificant. When we back out from the estimation the underlying parameters of the loan supply function, we find that the elasticity of supply of loans with respect to the interest rate is extremely high.[35] The results suggest that our assumption about a (perfectly) elastic supply of funds is close to the historical reality. Moreover, as we can see in **Figure 7**, this specification generates an implausible predicted borrowing rate significantly below the usury rate in the mid-1650s.

Figure 7
Corporation of London borrowing rate, actual and predicted: 1638-1683
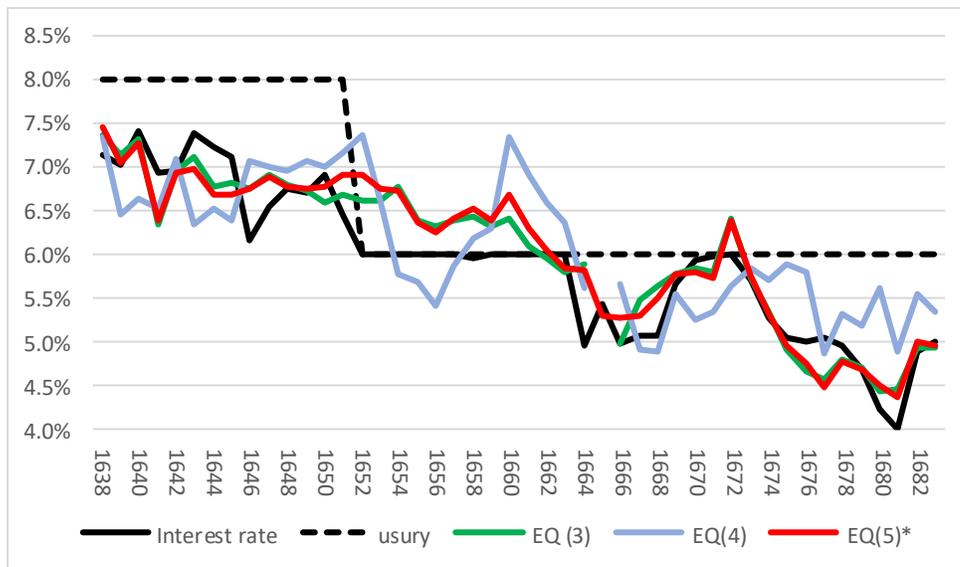
Notes: Based on the estimation results from **Table 2**.
* Equation (5) from column (3) using only variables significant at 10% level: stock of debt, current ratio Anglo-Dutch war, and lagged real GDP.

Finally, when conduct a horse race between the two specification we find (**Table 2**, column (3)) that a mixed estimation of financial ratios and political dummy variables (column 4), shows that

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[35] The point estimate for θ is 1.46e-07. Therefore, a = 6849315.

the model that assumes that the borrowing costs of the Corporation of London are a function of the risk free (Dutch) rate and liquidity and risk premiums, dominates.

3. The London-Amsterdam spread

Our previous analysis showed that the Dutch and London rates commoved throughout the 17th century and that the preferred model is the elastic funds and risk premium model. In this subsection, we estimate spread equations between Holland and London using both Dutch yield series (**Figure** *1*). We take the specification in the equation reported in column (1) of **Table** *2* and drop the statistically insignificant variables. To interpret the constant term of the regression as the initial spread, we standardize the quantitative variables: the stock of debt and the current ratio. We use the results of the regression and additional data and results to analyze the determinants of the spread and what caused it to decline.

Table 3
The spread between the Corporation of London and the Province of Holland borrowing rate:1638-1683

|	(1) $i_t - r_t = c + \gamma_i \alpha_{it} + \delta l_t + u_t$	(2) $i_t - rgj_t = c + \gamma_i \alpha_{it} + \delta l_t + u_t$
l_t	-0.022*** (-6.19)	-0.042*** (-8.94)
Current ratio	-0.011*** (-4.58)	-0.011*** (-3.58)
Anglo-Dutch	0.006*** (5.46)	0.006*** (2.55)
constant	0.0116*** (18.84)	0.0144*** (19.39)
N	46	46
r2_mz	0.61	0.71
r2_ml	0.57	0.68

Notes: Corporation of London borrowing costs, i_t; log outstanding debt, l_t; and *current ratio* from LMA: COL/CHD/CT/01/002-017. Province of Holland average cost of debt, r_t, from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795. Province of Holland average cost of debt, rgj_t from Gelderblom et al. (2016) Dummy variable equal 1 for the Third Anglo-Dutch War (1672-4).
Outstanding debt and current ratio were centered.
Regressions were estimated using cnreg *in Stata with robust standard errors.*

Our results (**Table** *3* and **Figure** *8*) show that there is a difference between using the two different Dutch yields series. However, the difference relates mainly to the pre-restoration period and the baseline spread. The baseline spread using the series presented by Fritschy (2017) is about 115

basis points, whereas it is about 145 basis points, according to Gelderblom et al. (2016). Both models predict the convergence between London to Amsterdam following the Restoration in 1660 is predicted by both models (**Figure *8*Error! Reference source not found.**) however, it is more remarkable if our Dutch reference series is that of Gelderblom et al. (2016).

Figure 8
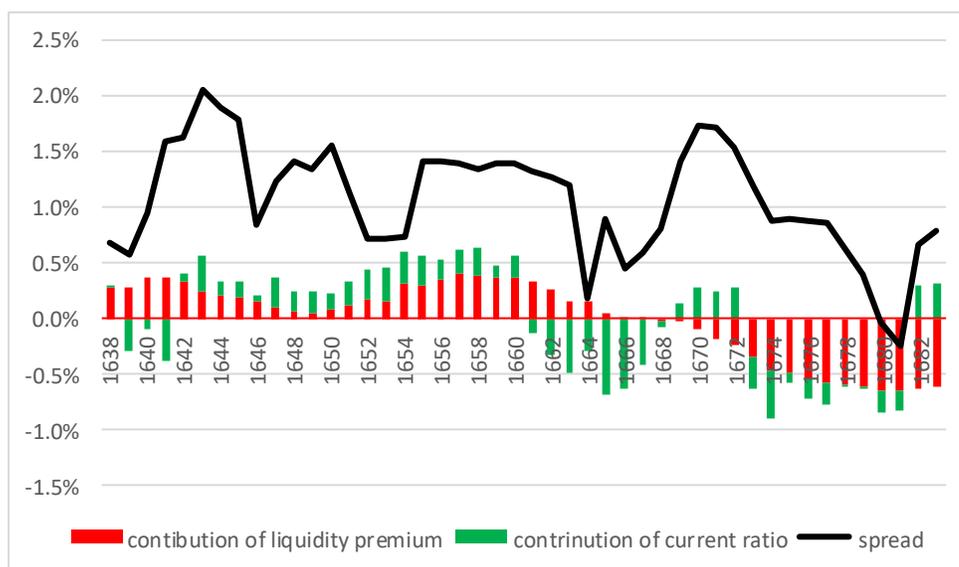**The Spread between London and Amsterdam: 1638-1683**
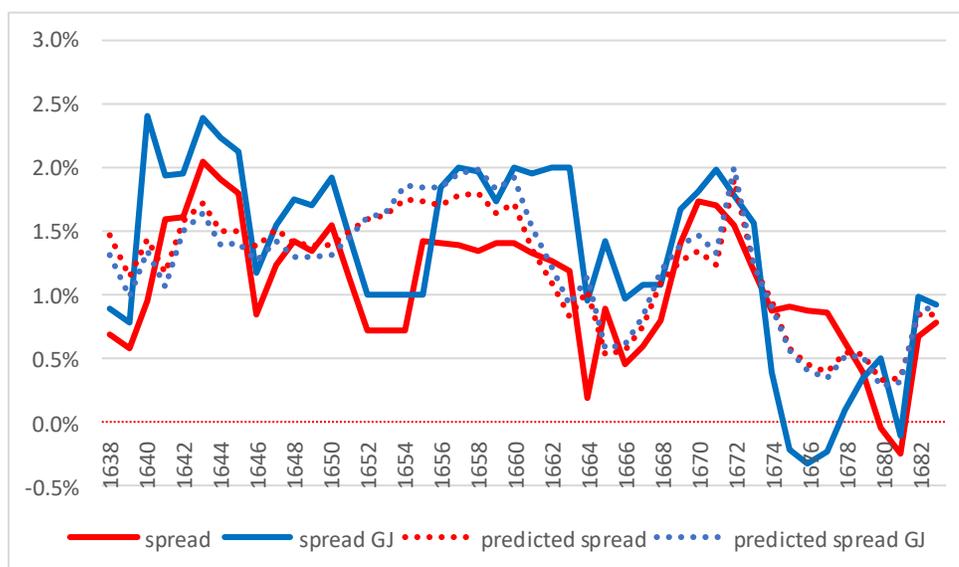
Sources: London: COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-006
Province of Holland spread: average cost of debt from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795. Province of Holland: spread GJ: market prices communicated by Gelderbloom and Joonker.
Predicted values based on the results reported in *Table 3*.

Our results establish the co-movement of borrowing rates in London and Amsterdam. The results also show the existence of a risk premium on London borrowing above that of Amsterdam. It is interesting to evaluate how much of the difference in yields can be attributed to the higher risk of English debt as this may reflect a lower trust in English institutions during the Stuart reign (North & Weingast 1989). Since Amsterdam boasted a stock exchange since 1602, we may assume that part of the spread stems from a liquidity premium. We can infer the magnitude of the liquidity premium from the Corporation of London accounts that report loan brokerage fees amounting to 25 basis points in during the early years of borrowing 1641 to 1647.[36] From our regression results (**Table *3*, Figure 9**) we can see that our proxy for liquidity, the size of the debt, contributed about

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[36] col/chd/ct/01/004-6, for example: col/chd/ct/01/005 fol. 72.

25 basis points to the spread from 1641 to 1647. The rising liquidity toward 1683 contributed, according to our regression results to a decline of about 65 basis points.

Figure 9
The contribution of liquidity and time-varying risk premium to the spread between London and Amsterdam: 1638-1683

Sources: London: COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-006.
Province of Holland spread: average cost of debt from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795.
We computed the contributions from the coefficients reported in *Table 3*, column (1).

The Corporation of London debt was unsecured, whereas the province of Holland's short term borrowing was secured by tax revenues. The difference between the cost of debt secured with the Coal Tax revenues (similar to the borrowing by the province of Holland) and the unsecured borrowing can be used to proxy this difference. We show (section 5 below) that the risk premium paid on unsecured debt was 50 basis points.

Another part of the constant term in the regression is probably capturing the term premium. The average maturity of the loans to the Corporation of London was four years whereas most of the borrowing by the province of Holland after 1628 was in short term bills. Therefore, lending to the Corporation of London probably entailed a higher term premium, but our data do not provide us with the possibility to estimate it.

Summarizing, the spread (**Figure 8Error! Reference source not found.**) ranges from 115 to 145 basis points (with average time-varying risk premium). Deducting the liquidity (25 to 65 basis

points), collateral (50 basis points), and longer maturity premia, may well reduce the 'constant' risk premium to below 50 basis points. We used the current-ratio as a short-term financial solvency measure to capture the time-varying risk premium. Our regression results show (**Figure 9**), that when the short-term financial situation of the Corporation of London was strong, the spread between London and Holland declined by 35 to 65 basis points – eliminating the risk premium between the two cities.

Our dummy variable captures the effect of the Third Anglo-Dutch War (1672-4) that also included the 'stop of the exchequer' (1672). The effect amounts to 70-80 basis points (**Table 3**). Therefore, the part of the spread that we can attribute to risk (financial and or political) amounts to 35 to 80 basis points. By comparison, the spreads of the countries facing default in the Eurozone (the PIIGS) in 2011, were 200 to 600 basis points and the spread between German and Italian 10-year government bonds in 2019 is above 200 basis points. It appears that during the Stuart regime was not seen by contemporaries as risky as some Eurozone economies.

4. Were the usury laws a binding constraint?

The usury ceiling was lowered in 1651 to 6% and remained at that level throughout the rest of the 17th century. It was further reduced to 5% in 1713. The debate around the level of the usury laws and their impact on the money and land market was one of the first political-economic debates of the age of enlightenment. The debate involved no other than John Locke (1691). Temin and Voth (2008) showed, using the accounts from Hoare's bank, that the usury ceiling was binding. Therefore, Hoare's Bank resorted to credit rationing. Our sample has a few years when the usury ceiling seems to have bounded the borrowing rate of the Corporation of London. The main period was the interregnum period before the restoration (**Figure 6**). To take account of the possibility that the usury laws were binding, we estimated the models reported above using censored regression analysis. The predicted value of these regressions provides us with the counterfactual, 'shadow' interest rate that would have prevailed in their absence.[37]

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[37] We assume and empirically established that the supply of savings for investment in the Corporation of London's debt was very elastic. Therefore, the reduction of interest rates to the usury level would not affect the quantities invested. Following the historical debate on usury laws, Habakkuk (1952) claimed that given the elastic supply of funds for financial investments, the reduction of the usury ceiling in 1651 was mainly a suppression of the risk premium.

We show the predicted borrowing rates for the Corporation of London in **Figure 7**. We can see that from their legislation in 1651 until their reinstatement by Charles II in 1661; the counterfactual borrowing rate would have been some 50 basis points above the usury ceiling of 6%. From 1662 till 1683 the usury rate was binding only once – in 1672 when Charles II defaulted on his loans to the goldsmith bankers (the Stop of the Exchequer). During that year, the counterfactual borrowing rate was about 6.5%. The magnitude of the effect of the financial crisis triggered by royal default on the London financial market seems to have been quite small by comparison to borrowing rates in crisis times after the Glorious Revolution (Sussman & Yafeh 2006).

For robustness, we estimated the model used by Temin and Voth (2008) to test the effect of the usury law reduction on Hoare's Bank. They used an OLS regression with a dummy variable for the period after 1714 when the usury rate declined to 5%. We used a dummy variable for the period after 1651 when the usury rate declined to from 8% to 6%. The main effect of this estimation (**Table** *2* column (4)) is to reduce the size and significance of the Dutch lending rate. According to this specification, the effect of the reduction of the usury rates by 2% was to lower the Corporation of London borrowing rates by 83 basis points.

The predicted values generated from the OLS regression (**Figure** *10*) suggest that the usury rate had only a marginal impact on the credit market after 1651 compared to an effect of about 50 basis points when we used the censored regression. The OLS estimation leads to an interpretation that lowering the usury rate to 6% was consistent with developments in the credit market. The censored estimation suggests otherwise. This difference in interpretation is visible in 1672 during the financial crisis of the 'stop of the exchequer.' For this episode, the OLS regression predicted value is at the usury rate, whereas according to the censored estimation, the usury rate was binding (Li, 2019). To conclude, the lowering of the usury rate to 6% probably lowered the borrowing costs of credible borrowers in London by as much as 50 basis points during the 1650s.

Figure 10
Corporation of London borrowing rate, actual and predicted the effect of usury: 1638-1683
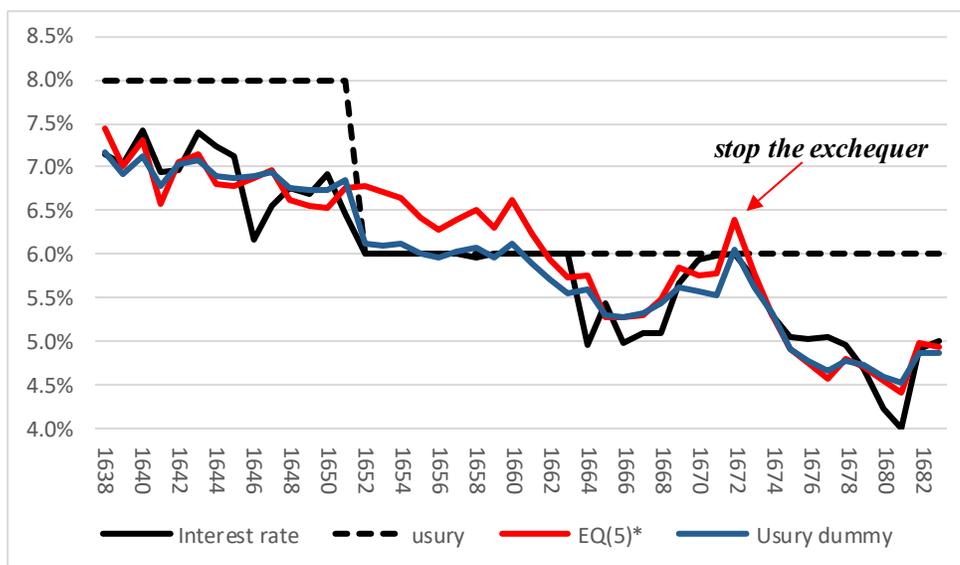
Notes: Based on the estimation results from *Table 2*.

* Equation (5) from column (3) using only variables significant at 10% level: stock of debt, current ratio Anglo-Dutch war, and lagged real GDP. Prediction based on usury dummy from column (4) using only variables significant at 10% level: stock of debt, current ratio Anglo-Dutch war, and lagged real GDP and usury dummy.

## 5. Estimating the risk premium on unsecured debt

In 1672 and 1673 the Corporation of London borrowed on its own, unsecured, credit and the security of the Coal Tax receipts. The collection of a Coal Tax was granted by Parliament to the Corporation of London to finance the public rebuilding projects.[38] The practice of assigning tax revenues earmarked to repay borrowing emerged according to Murphy (2013) during Downing's tenure ay the exchequer in the 1660s.[39] The total amount borrowed on either account from January 1672 to September 1673 was comparable - £69,000 and £61,000, respectively. **Figure *11*** plots the weighted (by loan amount) average of monthly borrowing rates and the corresponding borrowing

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[38] For further discussion, see Coffman et al. (2019).

[39] Coffman (2012) arugues that this development occurrced much earlier.

amounts. We can divide the period into two – the first, from January 1672 to January 1673 and the second from February to September 1673. During the first sub-period, the unsecured borrowing rate was 6%, and that of the secured borrowing was lower. The average monthly risk premium in that sub-period was about 50 basis points. However, we showed in the previous sub-section that in 1672, the usury rates were binding. Using the predicted interest rate (**Figure *10***) as a proxy for the shadow interest rate, the shadow risk-premium was probably closer to 100 basis points.

Figure 11
Secured versus Unsecured Borrowing by the Corporation of London:1672-1673
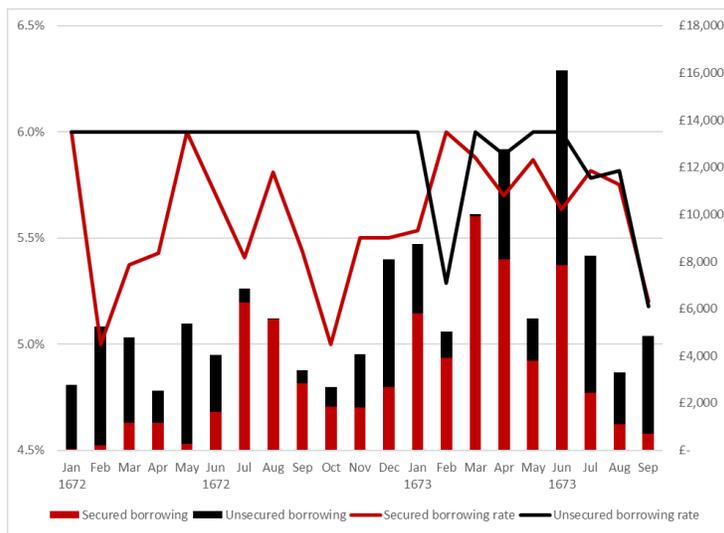
Sources: COL/CHD/LA/01/001 and COL/CHD/DM/01/001.

In the second sub-period, the spread between the borrowing rates is much smaller. A possible explanation for the reduction in the spread is the perception that the precedent of granting the Corporation of London the right to collect a tax, could be applied in other circumstances. This explanation is consistent with the literature on the effect of the fiscal capacity and the cost of (sovereign) borrowing.[40] Alternatively, once the effect of the financial crisis triggered by the 'stop of the exchequer' subsided and interest rates declined below the usury rate, the premium commanded by secured debt declined. This explanation suggests that in normal times, reputation may be sufficient to reduce the cost of borrowing. During a financial crisis, investors may prefer a harder commitment.[41]

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[40] In the British historical context see: Seghezza (2015) and O'Brien (2002).
[41] For theoretical explanations, see Gorton and Ordonez (2014) and Ordoñez (2013).

Conclusions

The financial development of London in the 17th century, as reflected in the volumes and cost borrowing of the Corporation of London, advanced along similar lines to those of its rival Amsterdam. In both countries, the cost of capital declined through the 17th century by between 300 and 400 basis points. The supply of capital came mainly from London's wealthy citizens and the gentry who resided in its vicinity. During the 17th, the economy experienced financial deepening as the volume of financial assets held by individuals increased. The stock of the Corporation of London's debt alone increased threefold. Our estimation results show that increasing liquidity in England and the decline of 'global' interest rates account for the dramatic decline.

We show that the spread between London and Amsterdam declined to only 50 basis which is very small when compared to the risk premiums paid by the British government in the 30 years following the Glorious Revolution (Sussman & Yafeh 2006). The similarity between the exalted financial development of Amsterdam and that of Stuart England provides another piece of the story of the emergence of British economic supremacy.

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