The Transition to Locked-In Capital in the First Corporations: Venture Capital Financing in Early Modern Europe

Rajkamal Vasu*

November 19, 2017

Abstract

Capital lock-in is the legal feature of a modern corporation which prevents the equity investors from forcing the firm to return their capital. Why did it emerge for the first time in the Dutch East India Company before it did in England? To answer this question, I develop a model in which equity investors choose the duration for which their capital is pledged to the firm. The duration depends on three factors, namely the incentive of the managers to divert capital from the firm, the uncertainty about the productivity of the technology used by the firm and the probability of expropriation of capital by the state. I argue that capital lock-in was first adopted in the Dutch East India Company because there was less uncertainty regarding the productivity of intercontinental trade in the Netherlands compared to England. I show that the uncertainty about innovative technologies affects the adoption of capital lock-in even today, for example in the venture capital and private equity industries.

Keywords: Locked-In Capital, Financial History, Venture Capital, Business History

JEL Classification: G32, N23, N83, G24

*Kellogg School of Management, Northwestern University. I am extremely thankful to Joel Mokyr for his valuable suggestions, insights and guidance. I have benefited greatly from the advice of Michael Fishman, Carola Frydman and Michael Powell. I am grateful to all of them. I also thank Mitchell Petersen for his insights on the venture capital and private equity industries. The errors are all mine.

1 Introduction

Locked-in or permanent capital is an important feature of the modern corporation. It refers to the fact that a company is never required to return the equity capital to equity investors. Permanent capital is also sometimes defined as the inability of shareholders to force dissolution of the company.[1] I study why this feature emerged first in the Netherlands in the Dutch East India company and only later in England in the English East India company. Using lessons from its emergence, I also provide insights into the variation of permanent capital in the cross section today.

The permanent capital base adopted by the East India Companies differed from the business practices in the late sixteenth century which used terminable capital.[2] Under this system, investors provided the funds to the enterprise for a finite period of time, after which it was liquidated.[3] For example, in the case of a shipping company, when the ship came back, all the assets of the firm, including the ship, would be sold. The enterprise would then be terminated and the profits would be distributed to the investors.[4]

The transition to permanent capital is an important development for the economic historian since it is associated with economic development for at least two reasons. First, it eliminated hold up problems due to the threat of any of the partners demanding liquidation of the firm. Thus, it allowed fixed capital investment for the long term without

[1]For example, if you buy Amazon stock, you cannot return the stock to Amazon and ask for your investment back. You can only exit your investment by selling the stock to another investor. In other words, a shareholder cannot foce a firm to pay him his share of the firm value before $t = \infty$. Unlike debt, which has varying maturities, equity in a corporation is never short-term.

[2]However, they were not the first firms to use permanent capital or indeed the first corporations, though scholars often refer to them in this way. It would be more correct to say that they were the first big publicly traded corporations. The mills of Toulouse were the first corporations and used permanent capital. However, their shares were not traded publicly. In addition, their nature of business and the geographical limit of operations was decidedly modest and conventional in comparison to the East India Companies which were multinationals. See Sicard [2015] and Bris et al. [2015] for an excellent description and analysis of the mills of Toulouse. Harris [2009b] is also useful in putting the firms engaged in Eurasian trade in the right context in business history.

[3]In short, in the case of terminable capital, the investor can force the firm to pay his share of firm value before $t = \infty$. Think about this as essentially short-term equity, a feature which has disappeared from modern corporations. Permanent capital is not a binary choice. It need not be the case that the equity has a maturity of either 0 or ∞. Intermediate maturities are possible. Unlike short-term debt, which is payable at a specific time, short-term equity may be payable at an uncertain time, for example when an investor decides to cash out.

[4]Interestingly, even the accounting systems reflected this. Riemersma [1952] writes that "While modern bookkeeping accounts for outlays and returns in a continuous way, 16^{th} century accounts in Holland deal only two sharply separated moments at the beginning and end of the enterprise. The method is properly called venture-accounting; it operates in spurts, since it itemizes expenses at one date and returns at another date several months later."

fear of having to repay the equity investors.[5] Second, it goes hand in hand with the transferability of shares since transferring shares is the only way to exit an investment made in a corporation. This in turn necessitates the presence of a financial market where the shares in the firm can be traded. For example, the Amsterdam stock exchange was established and trading of shares of the Dutch East India company started not long after it was formed.

As against these benefits, the drawback of locking in the capital is that the investors cannot use threat of withdrawing capital to punish managers. Thus, permanent capital accentuates the agency costs and is an important chapter in the history of corporate governance as well. In fact, some of the earliest instances of corporate governance problems occurred in the Dutch East India Company, as detailed below.

In this paper, I develop a model of the choice made by a firm to adopt either a permanent or terminable capital structure. The model examines the trade off between benefits and the costs of having locked-in capital. The parameters of the model are the agency problem of investing capital in military warfare to support the state instead of in the firm, the uncertainty about the productivity of long-distance trade and the probability of expropriation of capital from the firm by the state. These parameters differed in England and Holland leading to different choices made in these countries. Their modern-day equivalents are the agency problems of self-dealing and empire building in modern corporations, the differing uncertainty about the productivity of the investment in unknown technology (for example in VC firms) and the threat of expropriation of the firm's capital in developing countries with weaker property rights.

I apply this model to the setting in which the English and Dutch East India Companies operated. I conclude that the difference between the two firms regarding their permanent capital stemmed primarily from the lesser uncertainty about intercontinental trade in the Netherlands compared to England. I also provide reasons why I think the prevailing explanation in the literature, the lack of a powerful king in the Netherlands, is inadequate as the sole reason to explain the difference.

The rest of the paper is organized as follows. The first few sections provide historical facts and background information in an attempt to make the paper self-contained.Section 2 introduces background information about long distance trade. Section 3 presents an overview of the political environment in England and the Dutch Republic in the early modern period and on the importance of the two East India companies to historians. Sections 4 and 5 go into great detail about their organizational structure and financing. Section 6 describes the model, solves it and gives some intuition about the results. Section

[5]According to some scholars, it is the predominant reason for the popularity of incorporation in the nineteenth century. See, for example, Blair [2003]. For a counter-view which argues that partnerships had lock-in features as well, see Ribstein [2005].

7 applies the model to the East India Companies to explain the differences in their financing. Section 8 concludes by providing a brief discussion on applying the the model to the contemporary worlds of venture capital and private equity firms.

2 Long-distance trade between Europe and Asia

The start of long-distance trade was an epochal moment in history which presented hitherto unforeseen challenges. It led to the development of institutions designed to handle such complexity. According to Douglass North, "In contrast, the history of long-distance trade in early modern Europe was the story of sequentially more complex organization that eventually led to the rise of the Western world."[6]. North [1990] highlights how this led to innovations to increase mobility of capital, decrease information costs and spread risks. All of these had a role to play in the shift towards permanent capital, as will be explained in greater detail.

Why was long-distance trade between Europe and Asia so different from the existing trade? Let us consider each of the three innovations described by North in turn and demonstrate why they were required. First of all,the capital requirement was much higher than other contemporary trade due to a host of reasons. Larger ships were needed (as much as 1000 tons as opposed to 100)[7] and the ships had to be equipped for the longer voyages. In addition, the ships needed military protection which necessitated equipment like guns and more provisions for soldiers. Trading posts had to be built in Asia. Money was needed to purchase bullion for the trade. All these meant an increased the demand for capital, particularly long-term fixed capital.

Regarding the risks, the increased duration of voyages, which could last years as opposed to months in the existing trade, meant that the business was conducted over longer horizon and associated with higher uncertainty in general. There was the risk of bad weather on the new routes, which could lead to the loss of goods and lives. In addition, pirates were a constant threat, as were possible clashes with other European companies trading to Asia. Further, there was a lot of geographical uncertainty since not not much was known about Asia. This also manifested itself in political risk regarding dealings with unknown rulers in Asia. The agency problems increased manifold since it was difficult to monitor agents working in Asia from Europe. To add to all this, there was the risk that the price of spices would fluctuate. All this points to a situation of Knightian uncertainty rather than risk.

Last, the information costs increased since the high capital requirements and risks

[6]North [1990], page 125. North and Thomas [1973] also discusses the importance of trade in the rise of the western world.

[7]See for example Chaudhuri [1965].

made personal finance impossible. In fact, the merchants had to finance the company using capital from non-merchants since other merchants could not supply all of the huge amount of capital required. This required them to seek funds from outside their personal network. Further, the cooperation with strangers had to be sustained for years. In short, the information asymmetry increased because the investors were different, the information to convey was more complex and because it had to be done over a longer duration.[8]

3 Overview of the two companies and their countries

3.1 The first public corporations- the English and Dutch East India Companies

The English and the Dutch East India Companies occupy a special place in business history for various reasons. They were the first public corporations and were by an order of magnitude the largest companies of their era. The Dutch East India company (henceforth also VOC) was among the largest companies ever, in fact the largest in terms of market capitalization if adjusted for inflation.The English East India Company (henceforth also EIC) ranked third in the stated capital by by 1717 among the largest businesses in Great Britain.[9] They were long lasting and existed for more than 200 years. They were the first true multinationals.

They were much more than mere business enterprises though. They ruled parts of the world as colonial powers. The EIC commanded an army of 200,000 soldiers, larger than many countries' armies. They were involved in many memorable episodes in history like the Boston tea party and the Opium Wars. Their cultural significance is also immense. They kept detailed records (25 Million Pages of Historical Records). The oldest handwriting in the Tamil language exists in the VOC archives. As a result, both companies have been objects of fascination for colonial and economic historians and have been studied in detail, so much so that the related literature is too big to be mentioned here.

3.2 The England and the Dutch Republic in the early 17^{th} century

The Dutch Republic was about to enter the Golden Age, a period when Dutch science, trade and art received global recognition. In fact, the Dutch Republic was the richest country of the world until 1848, when it was overtaken by England. There was no

[8]For a thorough explanation of these points, refer Harris [2005].

[9]Baskin and Miranti Jr [1999]

strong central power in the republic. The seven provinces of Holland, Zeeland, Utrecht, Guelders, Overijssel, Friesland and Groningen had their own governments and were very independent. The republic can thus be described as a confederation of confederations.[10] Another feature of the republic was the close ties of the the merchant elite with the government.

In contrast, England had a strong monarch. It was ruled by Charles I, who, in times of fiscal necessity, would levy taxes without parliamentary consent. A struggle for power between the king and parliament followed. The English Civil War happened between 1642-1651 and ended with a victory for the parliament. This struggle culminated in the "Glorious revolution" (1688) where King James II was overthrown by the parliament. So, by then end of the century, the parliament had become more powerful at the expense of the king.

In passing, it is worth noting that these countries at this time are additionally significant because this was the century before the industrial revolution. A lot of scholarship in economic history has gone into explaining why the industrial revolution didn't start in the Dutch republic, but rather in England. This however is not the focus of this paper.

4 The history, financing and organization of the English East India Company

Before the EIC, there were merchant companies in England trading to Europe (for example, to Spain, Russia and Levant). In 1591, three ships were sent to Asia; but only one returned. However, by the turn of the century, the merchants came to know about ships returning to Holland from East Indies with valuable oriental commodities. Before long, the EIC was founded in 1600 by a Royal charter. Out of 132 subscribers at the the first meeting of the EIC, 8 were aldermen and 23 Levant merchants (who were part of the insiders, investors familiar with the shipping business).[11] The remaining subscribers included people from all walks of life, 12 grocers, 3 drapers, 3 mercers, 2 iron-mongers, 2 cloth-workers, 2 skinners, 2 vintners, a goldsmith, a notary, a merchant tailor and a leather seller (who were the outsiders unfamiliar with the shipping business). In terms of capital, Levant Company members provided 25-33% of the capital invested in the first, third and fourth voyages. Figure 1 shows how the number of members of the other

[10]Source:"Institutions matter: Explaining successes of the Dutch Republic (1568-1795)", lecture by Boudewijn R.A. Bouckaert, available online at http://www.law.ugent.be/grond/oldsite/Organisatie/profesoren/Dutch%20Republic.doc, last accessed on March 15, 2017.

[11]The data on subscribes as well as the classification of insiders and outsiders is from Harris [2005].

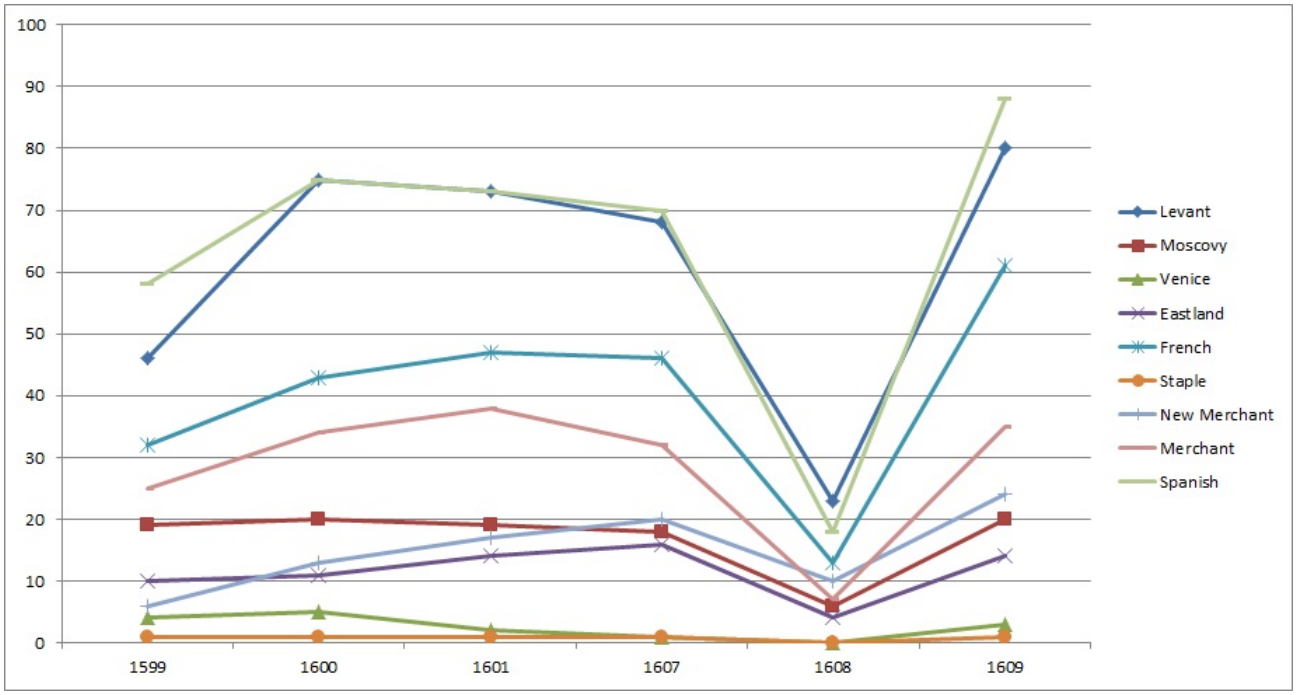


Figure 1: **Members of other companies in the EIC**

The figure graphs members of other companies who took part in the EIC across the years. The years correspond to the first meeting (1599), first charter (1600), first, second and third voyages (1601, 1607 and 1608), second charter (1609). The data has been taken from Table 5 in Harris [2005].

merchant companies who were also involved with the EIC changed over time.

Figure 2 shows the structure of the EIC. There were two courts which held meetings- a general court which consisted of all members and a court of committees (directors), who were elected. Any shareholder was eligible to stand for the election. Each shareholder had one vote (later one vote for every £500) in electing the governor and directors annually. Shareholders could remove directors. Thus, decision making was done by the majority. Also, both courts were updated regularly with detailed information about the progress of the voyages. There was thus a lot of information shared between the insiders and the outsiders.

Figure 3 gives details about financing of the first few voyages of the EIC. As can be seen, the initial voyages were financed separately and the profits of each voyage were distributed back to the shareholders. So, the EIC had a system of terminable capital. Investment in fixed capital was a problem under this system. There was also the confusion among the factors serving multiple principals from different voyages simultaneously. An entry in the company's court minutes make the extent of the problem clear, "Mr. Governor told the Court ... they must not expect for a year or two any division upon the

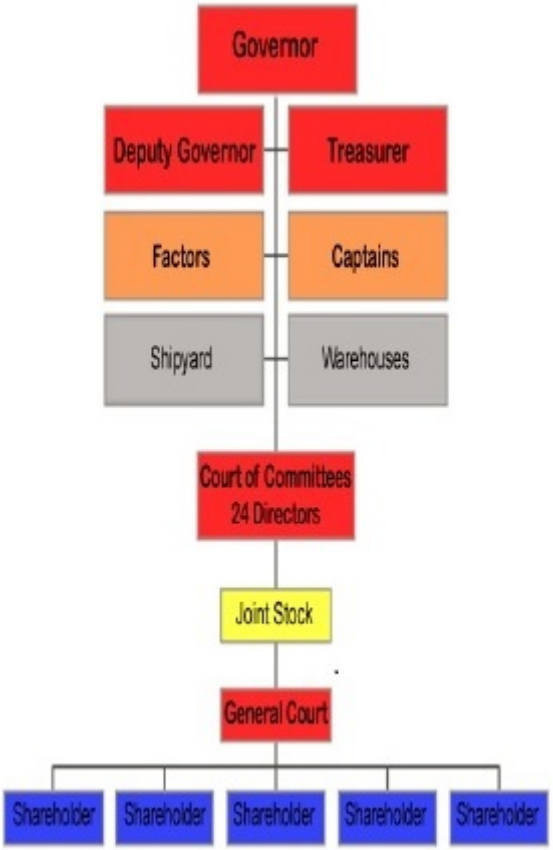


Figure 2: **Organizational Structure of the EIC**

Source: Harris [2009a]

Old Stock, for it was the policy and wisdom of the Hollanders by this way to advance the small stock which they raised at first to that greatness which now it is, by forbearing divisions, which course, if this Company observe, he doubted not to improve it for the good of the Company... ".[12] The company eventually shifted to permanent capital in 1657.

5 The history, financing and organization of the Dutch East India Company

The VOC was formed in 1602 by a merger of existing shipping companies which were later called the Voorcompagnieën (Pre-Companies). Between 1595 and 1601, these companies

[12]Calendar of State Papers Colonial, East Indies and Persia, Volume 8, pages 546-551. Accessed Online at British History Online on 16 March 2017. http://www.british-history.ac.uk/cal-state-papers/colonial/east-indies-china-japan/vol8/pp546-551.

Year	Voyage	Capital	Profit
1601	Voyage	£68,373	
1603	Voyage	£60,450	95%
1606	Voyage	£53,500	
1607	Voyage	£33,000	Total loss
1608	Voyage	£13,700	234%
1609	Voyage	£80,163	121.67%
1610	Voyage	£15,634	218%
1611	Voyage	£55,947	211%
1611	Voyage	£19,614	160%
1611	Voyage	£46,092	148%
1611	Voyage	£10,669	230%
1612	Voyage	£7,142	133.92%
1613-1621	Joint Stock	£418,691	87.50%
1617-1632	Joint Stock	£1,629,040	12.50%
1628	Voyage	£125,000	60%
1629	Voyage	£150,000	80%
1630	Voyage	£100,000	40%
1631-1642	Joint Stock	£420,700	35%

Figure 3: **Terminable capital in the EIC**

The table shows how the financing of the EIC voyages changed over time. The highlighted areas correspond to financing more than one voyage with the same funds. The non-highlighted areas correspond to financing each voyage individually.
Source: Chaudhuri [1965], page 209.

had sent 65 ships to the Asian market. 50 of them returned safely.[13] Figure 4 plots the voyages by year. So by the time the VOC was formed, there was already a lot of knowledge about commerce in the East Indies and the commodities of Asia due to the pre-companies.

The States General organized the merger and gave the VOC the right to have its own troops, warships and also to sign treaties. From the beginning, the VOC was considered a military enterprise too and the aim was to make it heavily armed to fight battles for the Dutch republic in Asia. The plight of its officers is reflected in this quote by Admiral Cornelis Matelieff from Bantam in 1608,“ If you try to combine a soldier and a merchant in one person, you will labor in vain.”

Even after the merger, the VOC retained characteristics of the pre-companies. For example, it had 6 chambers in the 6 cities of the Voorcompagnieën namely Amsterdam,

[13]See Jonker and Sluyterman [2001] or Gaastra [1982].

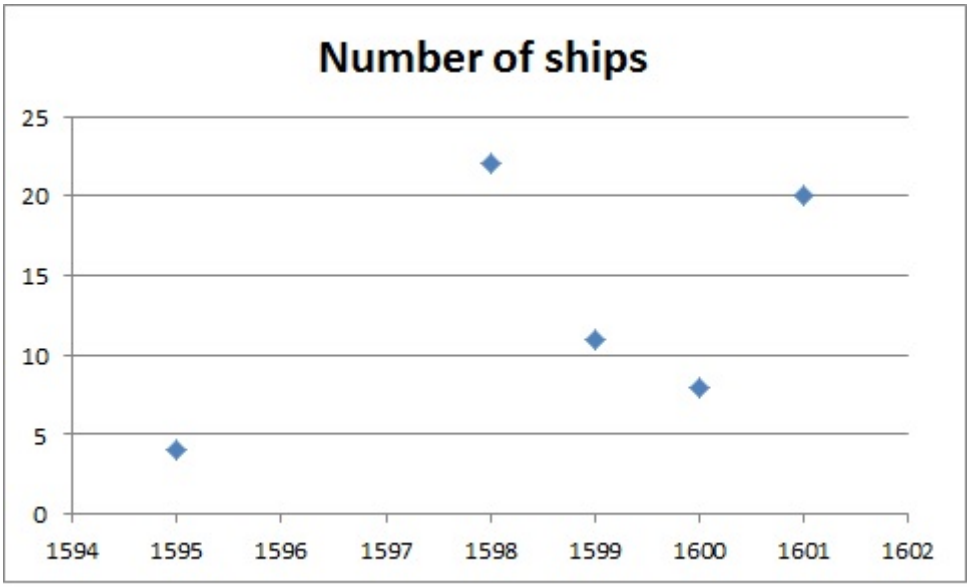


Figure 4: **The voyages of the Voorcompagnieën (Pre-companies)**

The graph shows voyages of the Voor-Compagnien (Pre-companies) by year from 1595 to 1601. In all, 65 ships were sent of which 50 returned safely.
Source: Gaastra [1982] and Parthesius [2010]

Zeeland, Rotterdam, Delft, Hoorn and Enkhuizen. In a sense, the organization of the company was similar to the federal organization of the republic. Figure 5 shows the structure of the VOC.

It is instructive to compare the structure of the VOC to the much more participatory structure of the EIC. The VOC had two types of shareholders: the participanten (non-managing shareholders), and 76 bewindhebbers (directors). The charter was essentially a contract between the directors and the state and devoted attention to the shareholders in only 6 of the 46 articles.[14]

The contrast between the VOC and the EIC is stark in this regard. First, the directors sat for life and could not be removed by election unlike the EIC. Second, the directors were appointed the states of the relevant province and were not elected. Third, the VOC never held a general meeting of shareholders or published any financial accounts in the first decade.

It is no wonder then that one of the earliest protests by shareholders in history was against the VOC in 1622, twenty years after it was formed. They accused the directors of self-dealing, insider trading, abuse of the remuneration rules and stealing from the company. The comparison with the EIC was not lost on the shareholders as this protest

[14]See Gelderblom et al. [2011] for further details.

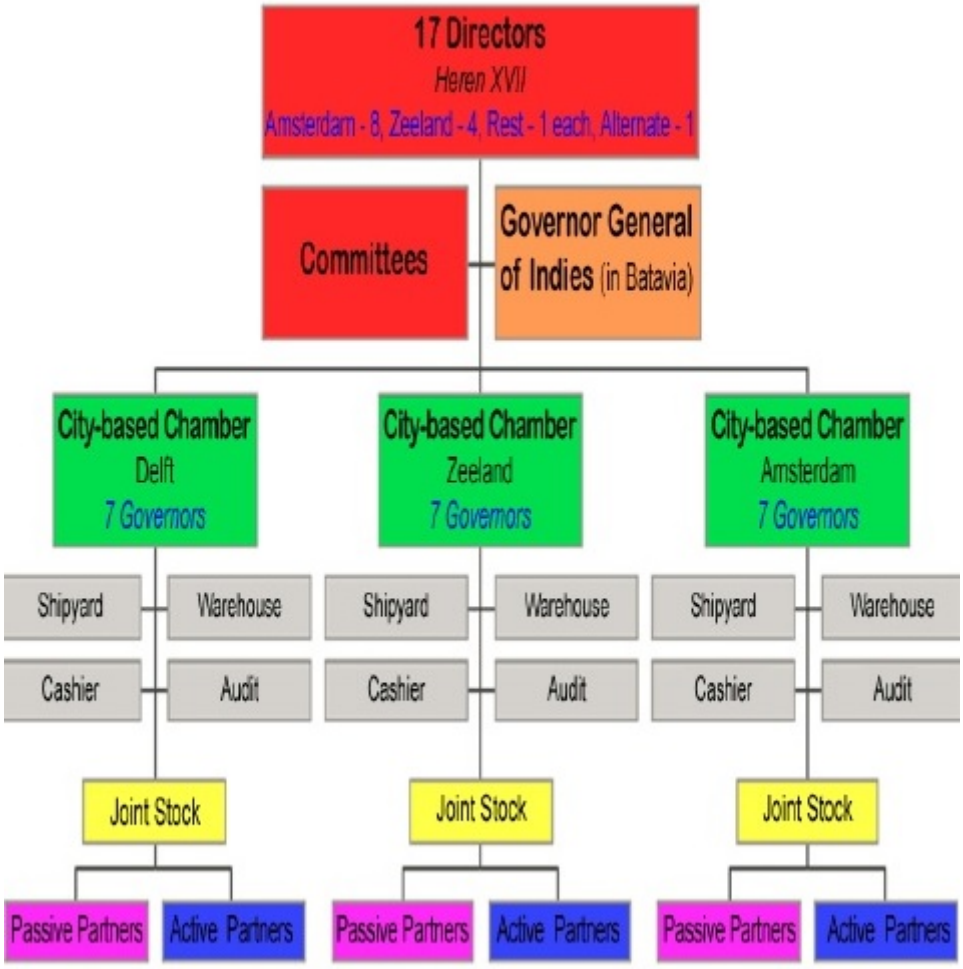


Figure 5: **Organizational Structure of the VOC**

Source: Harris [2009a]

shows- "In England as well, one sees that the participants in the EIC have the most to say: they remain masters of their own goods and each year appoint and dismiss from their midst as they see fit a Governor, his deputy and the Court of 24 Committees, as well as an auditor. And each shareholder is entitled to inspect the books and merchandise and see how the goods are converted to cash. This is evident from a certificate from the English East Indies Board, of which the complaining participants have obtained an authentic copy. Does this not turn you pale, oh shameless directors! Or does no red blood flow through your veins?..." Further, another pamphlet hints at the complete lack of communication between the directors and the shareholders, "There has been no audit. Everything has remained obscure and they havent come up with anything but procrastination and excuses instead of the accounts book, which, as we suspect, they had smeared with bacon and which was eaten by the dogs. It is said that only someone

who has something to conceal hides". Yet another points to the close ties between the state and the merchants, "If we complain to the Lords of the Towns and the Council of Aldermen there sit the Directors, the Establishment. To the Admiralty, there are the Directors. To the States-General, there we find that the States-General and the Directors are one and the same ..."[15]

In the pre-companies, each voyage was treated as a separate enterprise. In other words, they operated with terminable capital too, exactly like the EIC.[16] However, from the beginning, the VOC decided to abandon the model of financing voyage by voyage and raised equity capital for a period of 10 years, which was later extended indefinitely.[17]

The capital was raised in each of the 6 chambers. The number of subscribers in Amsterdam was 1,143 and in Zeeland 264 (registers for the other chambers do not survive). The capital subscribed in each of the 6 cities is given in Table 1. Who were the investors in Amsterdam? Table 2 indicates that many of them were immigrants.

Amsterdam	3,679,915
Zeeland	1,300,405
Delft	469,400
Rotterdam	173,000
Hoorn	266,868
Enkhuizen	540,000
Total	6,424,588

Table 1: **VOC capital subscribed in each of the 6 cities**

Source: Israel [1989], page 70

6 Towards a theory of permanent capital

In this section, I develop a model of a firm's choice between permanent and terminable capital.

6.1 Model set-up

There are two players in the model. The first is an investor(principal) who has funds to invest. The second is a manager (agent) who has no cash, but who manages a firm which

[15] All quoted in de Jongh [2011]

[16] See Parthesius [2010], page 34 or Bruijn et al. [1987], page 4 for more detials on these companies and their use of terminable capital.

[17] Steensgaard [1982] explains how much the VOC differed from the firms before it.

	All Investors	Amount Invested	'Chief Investors'	Amount Invested
North Netherlanders	785	2,023,715	40	635,100
South Netherlanders	302	1,418,700	38	871,160
Germans	38	137,900	3	60,000
English	3	6,900	0	0
Portuguese Jews	2	4,800	0	0

Table 2: **Number and amount invested by all investors and 'chief' investors in the Amsterdam Chamber of the VOC in 1602**

Source: Israel [1995], page 346

has an investment opportunity. The principal has 1 unit of capital which he can invest in the firm. There are three relevant dates $t = 0, 1$ and 2. Capital investment is possible at dates $t = 0$ and $t = 1$ and the value of the firm is realized at $t = 2$.

I assume that the production technology exhibits constant returns to scale. So, if I_f is invested in the firm at the beginning of a period, value of the firm at the end of the period

$$V_f = \tilde{\theta}\tilde{k}I_f \tag{1}$$

The productivity of the technology $\tilde{\theta}$ is a random variable. $\tilde{\theta}$ takes values $\theta - \delta$ with probability $\frac{1}{2}$ and $\theta + \delta$ with probability $\frac{1}{2}$. At $t = 1$, the value of $\tilde{\theta}$ is publicly observed. δ is thus a measure of uncertainty resolution after the first period

There is a risk-free asset in the economy which gives a return of 1. There are no other risky assets in the economy. Also,

$$\theta - \delta < 1 < \theta + \delta \tag{2}$$

so that if the productivity is low, it is optimal to invest in the risk-free asset rather than investing in the firm.

The principal wants to maximize the value of the firm at $t = 2$. However, there is an agency problem - the agent has private benefits to diverting some capital away from the firm to serve the military interests of the state. So, any time he invests, the agent allocates the investment made by the principal between the firm and the state even though the principal wants all the capital he supplies to be invested in the firm. The agent maximizes

$$V_a = I_f^{\alpha} + \lambda I_s^{\alpha} \tag{3}$$

λ is a measure of the agency costs. The higher the value of λ , the more is the difference in objectives between the principal and the agent and the more the distortion

in investment. The principal can observe the capital invested in the firm and the state though he cannot change the investment decision of the agent.

Let I denote the investment made by the principal, and I_f and I_s be the amounts invested by the agent in the firm and the state respectively. Then,

$$I = I_f + I_s \tag{4}$$

The principal hires the agent to invest the capital at $t = 0$. The principal can choose an organization structure $O \in \{T, P\}$. T corresponds to terminable capital where the capital is invested for a period and returned to the principal after the profits are realized. P corresponds to permanent capital where the capital is locked-in for two periods and cannot be withdrawn from the firm at $t = 1$. So, the principal's choice between T and P has the following implications.

If the principal chooses $O = T$, he gets his capital back at $t = 1$. He can then decide whether to invest again at $t = 1$ after seeing the realized value of the productivity. Given the parameter values in equation 2,the principal reinvests if the productivity is high, i.e. $\tilde{\theta} = \theta + \delta$. If $\tilde{\theta} = \theta - \delta$, an investment is not advisable since he can invest in the risk-free asset. So, there is some benefit to the option to wait for a period and then invest in the second period rather than investing directly for two periods. Without loss of generality, choose $\tilde{k} = 1$ if the capital is terminable.

Moreover, there are other benefits to choosing terminable capital. The principal can observe whether the agent has diverted money to the state , in other words has chosen $I_s > 0$ in the first period. If the agent has done so, the principal can replace the agent at $t = 1$. If he is replaced, the agent gets no utility and hence he will not divert funds in the first period for fear of being replaced.[18] In addition,the state cannot expropriate any of the firm's capital since it is distributed back to the principal every period and does not remain in the firm for long periods of time.

If the principal chooses $O = P$, he does not get to choose whether to reinvest at $t = 1$. The agent always reinvests at $t = 1$ even when the productivity is low since he is only concerned with maximizing V_a.[19] So, permanent capital leads to loss of control of the investment decision for the principal. In addition, the agent cannot be replaced at $t = 1$ even if he has diverted money to the state in the first period.

Further, since the capital is in the firm for long periods, the state expropriates a share ϕ of the firm value at $t = 2$. The principal will only get a fraction $(1 - \phi)$ of the firm value at $t = 2$. There are however some benefits of locked-in capital. Locking in

[18]In the second period, this is not a concern for the agent, so the conflict of interest will be a factor in that period.

[19]In other words, investing in the risk-free asset gives him no utility.

capital for two periods makes capital in both periods more productive. So, $\tilde{k} = k$, or the productivity in each period is multiplied by k, where $k > 1$.

6.2 The timing

To make matters clearer, the sequence of events in the game is as follows:

1. The principal (investor) chooses $O \in \{T, P\}$
2. The principal gives the agent the capital
3. The agent invests the capital in the firm and in the state.
4. The value of $\tilde{\theta}$ is observed
5. If $O = T$, the principal chooses whether to replace the agent
6. If $O = T$, the principal chooses whether to reinvest or not
7. The agent reinvests the capital if $O = P$ or if the principal had chosen to reinvest if $O = T$
8. The investment pays off
9. The state expropriates a fraction ϕ of the firm if $O = P$
10. The transfer is made from the agent to the principal

6.3 Model solution

First, let us calculate the investment by the agent in any period. The agent's problem is to maximize

$$\underset{I_f, I_s}{Max} \left[I_f^{\alpha} + \lambda I_s^{\alpha} \right] \tag{5}$$

in each period s.t.

$$I_f + I_m = I \tag{6}$$

Equating the marginal utilities,

$$I_f^{\alpha-1} = (\lambda) I_s^{\alpha-1} \tag{7}$$

Solving for the two unknowns from the two equations, we get

$$I_f = \frac{I}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \tag{8}$$

$$I_s = I\frac{(\lambda)^{\frac{1}{1-\alpha}}}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \tag{9}$$

Substituting in equation 1,

$$V_f = \tilde{\theta} k I \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right) \tag{10}$$

if P is chosen and

$$V_f = \tilde{\theta} I \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right) \tag{11}$$

if T is chosen

What is $V_{f,P}$, the expected payoff to principal on choosing $O = P$? Remember that the principal gets the value of the firm at $t = 2$. First, at $t = 1$,

$$V_{f,1} = \tilde{\theta} k \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right)$$

The agent reinvests all of $V_f = \tilde{\theta} k \left(\frac{1}{1+(\lambda)^{\frac{1}{1-\alpha}}} \right)$ at $t = 1$, but the state expropriates a fraction ϕ of the firm value at $t = 2$. So, at $t = 2$,

$$V_{f,2} = \left[\tilde{\theta} k \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right) \right]^2 (1 - \phi)$$

$V_{f,P}$ is just the expectation of $V_{f,2}$. Since

$$\mathbf{E}\left[\tilde{\theta}^2\right] = \frac{1}{2}\left[(\theta - \delta)^2 + (\theta + \delta)^2\right] \tag{12}$$

we get that

$$V_{f,P} = \frac{1}{2}\left[(\theta - \delta)^2 + (\theta + \delta)^2\right] \left[k \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right) \right]^2 (1 - \phi)$$

What is $V_{f,T}$, the payoff to principal on choosing $O = T$? As stated before, the agent doesn't divert capital in the first period since he can be replaced (So $\lambda = 0$ in the first period). Hence, at $t = 1$,

$$V_{f,1} = \tilde{\theta}$$

However, the agent will divert funds in the second period if reinvestment happens since there is no further investment and he cannot be punished at $t = 2$.

Also recall that $\tilde{\theta}$ is publicly observed at $t = 1$. Probability of $\tilde{\theta}$ being high is $\frac{1}{2}$. In this case, the principal will choose to invest again at $t = 1$. The amount reinvested= $\theta + \delta$. The value of the firm at $t = 2$ is then

$$V_{f,2} = (\theta + \delta)^2 \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right)$$

If $\tilde{\theta}$ is low, the principal will not reinvest in the firm at $t = 1$. In this case, he just invests $\theta - \delta$ in the risk-free asset at $t = 1$. So, his payoff is $t = 2$ is

$$V_{f,2} = \theta - \delta$$

So, $V_{f,T}$, the expected firm value at $t = 2$ is given by

$$V_{f,T} = \frac{1}{2} \left[(\theta - \delta) + (\theta + \delta)^2 \right] \tag{13}$$

The principal chooses $O = P$ if $V_{f,P} > V_{f,T}$ and $O = T$ otherwise.

So, he chooses $O = P$ if

$$\frac{1}{2} \left[(\theta - \delta)^2 + (\theta + \delta)^2 \right] \left[k \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right) \right]^2 (1 - \phi) > \frac{1}{2} \left[(\theta - \delta) + (\theta + \delta)^2 \right]$$

which simplifies to

$$k^2 \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right)^2 (1 - \phi) > \frac{1}{2} \frac{\theta - \delta}{\theta^2 + \delta^2} + \frac{1}{2} \frac{(\theta + \delta)^2}{\theta^2 + \delta^2} \left(\frac{1}{1 + (\lambda)^{\frac{1}{1-\alpha}}} \right) \tag{14}$$

6.4 Intuition about the model results

What is the intuition for the result obtained in equation 14? Consider each term on both sides of the equation.

The first term k^2 is a measure of the productivity of fixed capital over non-fixed capital and also the extent of hold-up problems. This is an advantage of permanent capital.

The second term $\left(\frac{1}{1+(\lambda)^{\frac{1}{1-\alpha}}} \right)^2$ is a measure of agency, a disadvantage of permanent capital. Note that as expected, this is decreasing in λ , the weight placed by the agent on the capital diverted to the state.

The third term $1-\phi$ is the threat of expropriation by the state, another disadvantage of choosing permanent capital.

On the right hand side of the equation, we have the terms representing the option value of waiting for the information regarding the productivity. This is an advantage of not locking-in capital.

What equation 14 essentially says is that if the the productivity gains from using permanent capital outweigh the costs of agency, higher expropriation risk and not having the option of waiting for more information about the technology, then permanent capital would be preferred over terminable capital.

7 Explaining the history of permanent capital in the English East India Company (EIC) and the Dutch East India Company (VOC)

I now go back to the setting of the East India Companies and try to explain why the VOC locked-in the capital for 10 years (which was not returned after 10 years and effectively became permanent) whereas the EIC financed each voyage separately.

7.1 Comparison of the two companies using the model

I start by providing comparisons between the two companies for each of the model parameters that matter. The parameters and the comparison are provided in table 3

First, consider the parameter δ, the level of uncertainty regarding the prospects of long-distance trade from Europe to Asia. By the time the VOC was set up, 65 Dutch ships had been to Asia, sent by the Voorcompagnieën . As a result, the uncertainty regarding the intercontinental trade decreased significantly in the Netherlands. In contrast, in England, the technology was yet not employed frequently. The English had heard that the Dutch were successful, but they had no idea whether their ships and captains could replicate the success in England. This was the most important difference between the two countries. In the Netherlands, the investors were thus likely to lock-in their capital for higher duration.

Next, consider λ, which is a measure of the agency costs. Both companies were set up to be businesses as well as firms providing military help to the state. However, in the case of the VOC, the merchants had close ties to the government. It is true that during the end of its time, the EIC too was essentially a quasi-government in parts of Asia, but in the beginning, its involvement with the government, though high, was less compared to the VOC. This being the case, the EIC was more likely to have used locked-in capital due to lesser agency frictions.

Next, the productivity k. It is certainly likely that the productivity was higher in the VOC due to the Dutch shipbuilding being advanced. However, East Indian trade in both countries would handsomely reward using capital for the long term and making fixed investments. This is unlikely to have significantly differed between the two countries, and hence to have played a major role in the differing choice.

Last, the parameter ϕ. It can be argued that the federal structure of the Dutch Republic meant that the VOC was faced with a lower value of ϕ than the EIC. However, there are multiple reasons to believe that this was not the primary reason why the nature of capital differed. I provide more details on this below.

Parameter	**Explanation**	**EIC**	**VOC**	**Permanent capital**
δ	The uncertainty regardng productivity of the investment in the new technology (long-distance trade between Europe and Asia)	High	Low	More likely for VOC
λ	The agency problem of investing capital in military warfare to support the state instead of in the firm	Low	High	More likely for EIC
k	Increase in productivity if the capital is permanent as opposed to terminable	High	High	Likely for both
ϕ	Expropriation risk by the central ruler	Low	High	More likely for VOC

Table 3: **Model parameter descriptions and comparisons between the English East India Company (EIC) and the Dutch East India Company (VOC)**

7.2 Related literature and contribution

My paper is most closely related to two others which also attempt to compare the practices of EIC and VOC. The first is Dari-Mattiacci et al. [2016] who argue that the lack of a central authority in the Netherlands was the key difference. They place a lot of importance on the Civil War in England which enabled the commitment of the monarch to abstain from expropriating the wealth of firms and led to the move away from terminable capital in the EIC. The second is Harris [2009a], who examines how the legal and institutional setting affected both of these companies. However, his focus is on the emergence of

financial markets rather than on the presence or absence of locked-in capital.[20]

In short, the current explanation in the literature focuses exclusively on the parameter ϕ in my model. However, this argument is at odds with the following historical facts.

First, if the absence of a monarch is the determining factor, then why did the Voorcompagnieën finance the voyages separately? It is difficult to argue that the monarch became more or less powerful between 1595 and 1602 when the VOC was set up.

Secondly, if the monarch became weaker in England due to the Civil War, then why did the EIC shift to financing few voyages together rather than separately early in its existence? This development happened much before the Civil war, as early as 1613. Refer figure 3 for the list of initial voyages made by the EIC and their financing.

Third, it is wrong to assume that the VOC planned to have permanent capital from the start. In reality, the capital was subscribed for a period of 10 years and was expropriated. In von Nordenflycht [2011], this incident is in fact referred to as "the great expropriation". It was thus a deviation from a plan necessitated by circumstances instead of something which arose from the lack of an authority to expropriate capital.

Fourth, in the modern world, we still see instances where the capital is pledged for a short duration even in developed countries where there is no threat from the state. It is tough to adequately explain this phenomenon using the fear of expropriation.

On closer observation, we find that the transition from terminable capital to capital lock-in happens in both countries. In both England and Holland, voyages start out being financed as separate enterprises. Then, there is a transition to financing them in groups. Finally, there is permanent capital. It is just that in Holland, the first part of this three-step process happened in the Voorcompagnieën than in the VOC.

The explanation then is that the initial conditions, specifically the uncertainty about the underlying technology, differed between the Netherlands and England. The Dutch decreased the uncertainty by trading for a decade before the VOC through the Voorcompagnieën. As a result, by the time the VOC was set up, the investors were ready to subscribe. There is evidence in the historical records of a rush for the VOC shares and a lot of delay and persuasion needed for forcing investment in the EIC.[21] Gelderblom [2009] makes the point that up to 30 per cent of the capital stock of the VOC was provided by non-merchants. Many of the investors came from professions other than trade and from varying geographical regions as per Harris [2009a] . Both these support the assertion that the prospects of international trade was less uncertain for people in the Netherlands and

[20] Another study, Harris [2005], takes an in-depth look at the EIC and in fact proved very useful for reference as well as data on the initial shareholders of the EIC. However, the comparison with the VOC is not the focus of that paper.

[21] See for example Harris [2005].

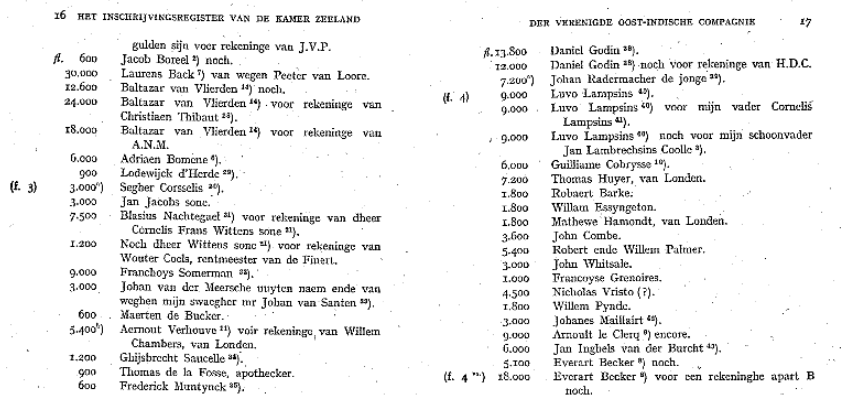
Sept. 22.	256. "The names of such persons as have written with their own hands, to venture in the pretended voyage to the East Indies (the which it may please the Lord to prosper), and the sums that they will adventure, the xxii. September 1599, viz."—		
			£
	1.	Sir Stephen Soame, Lord Mayor of London	200
	2.	Sir John Hart and George Boales	1,000
	3.	Sir John Spencer	800
	4.	Nich. Mosley, alderman	300
	5.	Paul Bannyng, alderman	1,000
	6.	Leonard Hallyday, alderman	1,000
	7.	Rich. Goddard, alderman	200
	8.	John Moore, alderman	300
	9.	Sir Stephen Soame, Rich. Carter, &c.	400
	10.	Edw. Holmden, alderman	500
	11.	Robert Hampson, alderman	300
	12.	Rich. Staper	500
	13.	Thos. Symonds	200
	14.	John Eldred	400
	15.	Robt. Coxe, grocer	250
	16.	Nich. Leat, ironmonger	200

Figure 6: **EIC shareholder list and amounts contributed for the first voyage**

Source: Calendar of State Papers Colonial, East Indies and Persia, Volume 2, pages 99-102. Accessed Online at British History Online on 16 March 2017. http://www.british-history.ac.uk/cal-state-papers/colonial/east-indies-china-japan/vol2/pp99-102.

there was no option value to investing later. Thus, the emergence of permanent capital was due to the difference in the parameter δ in my model rather than in ϕ. (I argue below that this holds true in explaining the variation in duration of the capital lock-in in today's world as well.)

One way to further validate this hypothesis would be to examine the list of shareholders for both companies in greater detail and map the profession of each investor to their knowledge of the details of intercontinental trade. The uncertainty about the productivity of intercontinental trade is not the same for the more informed investors (merchants trading to the Levant), the less informed investors (merchants trading to say Spain who knew something about oceanic trade) and the completely uninformed investors (say a fishmonger). The list of initial investors survives for the EIC and for two chambers of the VOC. Figure 6 and figure 7 present screenshots of the shareholder lists and the



16 HET INSCHRIJVINGSREGISTER VAN DE KAMER ZEELAND

gulden sijn voor rekeninge van J.V.P.
fl. 600 Jacob Boreel [2]) noch.
30.000 Laurens Back [7]) van wegen Peeter van Loore.
12.600 Baltazar van Vlierden [14]) noch.
24.000 Baltazar van Vlierden [44]) voor rekeninge van Christiaen Thibaut [23]).
18.000 Baltazar van Vlierden [24]) voor rekeninge van A.N.M.
6.000 Adriaen Boncne [6]).
900 Lodewijck d'Herde [29]).
(f. 3) 3.000[c]) Segher Corsselis [26]).
3.000 Jan Jacobs sone.
7.500 Blasius Nachtegael [21]) voor rekeninge van dheer Cornelis Frans Wittens sone [31]).
1.200 Noch dheer Wittens sone [31]) voor rekeninge van Wouter Cools, rentmeester van de Finett.
9.000 Franchoys Somerman [28]).
3.000 Johan van der Meersche uuyten naem ende van weghen mijn swaegher mr Johan van Santen [32]).
600 Maerten de Bucker.
5.400[b]) Aernout Verlouve [11]) voir rekeninge van Willem Chambers, van Londen.
1.200 Glijsbrecht Saucelle [36]).
900 Thomas de la Fosse, apothecker.
600 Frederick Muntynck [16]).

DER VEREENIGDE OOST-INDISCHE COMPAGNIE 17

fl. 13.800 Daniel Godin [18]).
12.000 Daniel Godin [18]) noch voor rekeninge van H.D.C.
7.200[c]) Johan Radermacher de jonge [33]).
(f. 4) 9.000 Luvo Lampsins [47]).
9.000 Luvo Lampsins [46]) voor mijn vader Cornelis Lampsins [41]).
9.000 Luvo Lampsins [46]) noch voor mijn schoonvader Jan Lambrechsins Coolle [3]).
6.000 Guilliame Cobrysse [10]).
7.200 Thomas Huyer, van Londen.
1.800 Robaert Barke.
1.800 Willam Essyngeton.
1.800 Mathewe Hamondt, van Londen.
3.600 John Combe.
5.400 Robert ende Willem Palmer.
3.000 John Whitsale.
1.000 Francoyse Grenoires.
4.500 Nicholas Vristo (?).
1.800 Willem Pyndc.
3.000 Johanes Maillairt [48]).
9.000 Arnoult le Clerq [8]) encore.
6.000 Jan Inghels van der Burcht [42]).
5.100 Everart Becker [8]) noch.
(f. 4 [vs]) 18.000 Everart Becker [8]) voor een rekeninghe apart B noch.

Figure 7: **VOC shareholder list and amounts contributed**

Source: Unger [1950]

amounts invested by them for both companies. These lists can be used to look at the how the uncertainty about the productivity varied in the cross section and across time and whether this corresponds to the shift from terminable to permanent capital.

8 Discussion about applying the theory to today's world and concluding remarks

The theory presented in this paper is general and can be applied to the modern world by suitably redefining parameters. Table 5 shows the modern-day equivalents of each of the parameters in the model.

How can the model be applied to the world we see around us today? There may be cross sectional variation in a country in the duration of capital lock-in depending on the uncertainty surrounding the technology. There may be cross-sectional variation across countries, particularly in countries with weaker property rights where expropriation may be a threat. This suggests that the shift to permanent capital may be more advantageous in developed countries. Similarly, industries which need high fixed capital i.e. a high k or with low agency costs (where managers can be monitored and empire building is unlikely) are more likely to employ permanent capital.

The final evidence for the assertion that it is the uncertainty regarding a new technology which makes investors hesitant to use permanent capital comes from the venture capital/ private equity industry. VC and PE firms have equivalents for each of the three methods we saw in the East India Companies. For example, financing one voyage at a time finds its equivalent in search funds and fundless sponsors. The following description

Parameter	Description in the historical context	Description in the modern context
δ	The uncertainty regarding the productivity of the investment in new technology (long-distance trade between Europe and Asia)	The differing uncertainty about the productivity of the investment in unknown technology (for example in VC firms)
λ	The agency problem of investing capital in military warfare to support the state instead of in the firm	The agency problems of diverting capital by self-dealing instead of investing in the firm and managerial empire building
k	Increase in productivity in intercontinental trade if the capital is permanent as opposed to terminable	Increase in productivity in the business if the capital is permanent as opposed to terminable
ϕ	Expropriation risk by the central ruler	Expropriation risk in countries with weaker property rights

Table 4: **Model parameter descriptions in the historical context and in the modern context**

The English and Dutch East India Companies	Venture Capital / Private Equity Industry
Each voyage financed as a separate enterprise	"Search funds" and "fundless sponsors"
A group of voyages financed as a separate enterprise	VC fund/ PE fund with say a 10 year commitment
Permanent Capital with no fixed duration of equity investment	Family "Fund", which is like a corporation with no fixed duration of equity investment

Table 5: **The three different durations of capital lock-in in the East India Companies and their equivalents in today's VC and PE firms**

of search funds is almost identical to that of the early stages of the EIC, "In a typical search fund, investors purchase one or several units of initial search capital, at about USD 25,000 to USD35,000 per unit ... If the initial search capital is exhausted before a target can be identified, principals may choose either to close the fund or to raise additional funding to continue the search. Contributors to initial search capital receive the right, but not the obligation, to participate in the any subsequent round of acquisition capital."[22] Table 5 provides all three equivalents.

In this paper, I have attempted to explain the origins of permanent capital, one of the important features of public corporations. The East India Companies were perhaps the first true venture capitalists involved in a business characterized by Knightian uncertainty, not risk. Consequently, the approach adopted in this paper can be applied to variation in the permanence of equity capital even today in settings of great technological uncertainty. Viewed in this light, this paper is really a modern view of historical venture capital financing or, if you wish, a historical view of modern venture capital financing.

[22]Source: http://www.captiva-uk.com/stages-of-a-search-fund/, accessed on March 17, 2017.

References

Jonathan B Baskin and Paul J Miranti Jr. *A History of Corporate Finance*. Cambridge University Press, 1999.

Margaret M Blair. Locking in Capital: What Corporate Law Achieved for Business Organizers in the Nineteenth Century. *UCLA Law Review*, 51:387–455, 2003.

David Le Bris, William N Goetzmann, and Sébastien Pouget. The Development of Corporate Governance in Toulouse: 1372-1946. Working paper, National Bureau of Economic Research, 2015.

Jacobus R Bruijn, Femme S Gaastra, and I Schffer. *Dutch-Asiatic Shipping in the 17th and 18th Centuries: Vol I: Introductory Volume*. 1987.

Kirti N Chaudhuri. *The English East India Company: The Study of an Early Joint-stock Company 1600–1640*, volume 4. Taylor & Francis, 1965.

Giuseppe Dari-Mattiacci, Oscar Gelderblom, Joost Jonker, and Enrico C Perotti. The Emergence of the Corporate Form. Working paper, 2016.

Johan Matthijs de Jongh. Shareholder Activists Avant la Lettre: The Complaining Participants in the Dutch East India Company 1622–1625. In Jonathan G. S. Koppell, editor, *Origins of Shareholder Advocacy*. Palgrave Macmillan US, 2011.

Femme S Gaastra. De Geschiedenis van de VOC. 1982.

Oscar Gelderblom. The Organization of Long-distance Trade in England and the Dutch Republic, 1550–1650. In Oscar. Gelderblom, editor, *The Political Economy of the Dutch Republic*. Aldershot: Ashgate, 2009.

Oscar Gelderblom, Abe de Jong, and Joost Jonker. An Admiralty for Asia: Business Organization and the Evolution of Corporate Governance in the Dutch Republic 1590–1640. In Jonathan G. S. Koppell, editor, *Origins of Shareholder Advocacy*. Palgrave Macmillan US, 2011.

Ron Harris. The Formation of the East India Company as a Cooperation-enhancing Institution. Working paper, 2005.

Ron Harris. Law, Finance and the First Corporations. In James J. Heckman, Robert L. Nelson, and Lee Cabatingan, editors, *Global Perspectives on the Rule of Law*. Routledge, 2009a.

Ron Harris. The Institutional Dynamics of Early Modern Eurasian trade: The Commenda and the Corporation. *Journal of Economic Behavior & Organization*, 71(3):606–622, 2009b.

Jonathan I Israel. *Dutch Primacy in World Trade, 1585-1740*. Clarendon Press, 1989.

Jonathan Irvine Israel. *The Dutch Republic: Its Rise, Greatness and Fall, 1477-1806*. Clarendon Press Oxford, 1995.

Joost Jonker and Keetie Sluyterman. *At Home on the World Markets: Dutch International Trading Companies from the 16th Century until the Present*. McGill-Queen's Press-MQUP, 2001.

Douglass C North. *Institutions, Institutional Change and Economic Performance*. Cambridge university press, 1990.

Douglass C North and Robert Paul Thomas. *The Rise of the Western World: A new Economic History*. Cambridge University Press, 1973.

Robert Parthesius. *Dutch Ships in Tropical Waters: the Development of the Dutch East India Company (VOC) Shipping Network in Asia 1595-1660*. Amsterdam University Press, 2010.

Larry E Ribstein. Should History Lock in Lock-in? *Tulsa L. Rev.*, 41:523, 2005.

Jelle C Riemersma. Trading and Shipping Associations in 16th Century Holland. *Tijdschrift voor geschiedenis*, 65:330–338, 1952.

William N Sainsbury, editor. *Calendar of State Papers Colonial, East Indies and Persia, Volume 2, 1513–1616*. London: Her Majesty's Stationery Office, 1864.

William N Sainsbury, editor. *Calendar of State Papers Colonial, East Indies and Persia, Volume 8, 1630–1634*. London: Her Majesty's Stationery Office, 1892.

Germain Sicard. *The Origins of Corporations: The Mills of Toulouse in the Middle Ages*. Yale University Press, 2015.

Niels Steensgaard. The Dutch East India Company as an Institutional Innovation. In Maurice Aymard, editor, *Dutch Capitalism and World Capitalism*. Cambridge University Press, 1982.

W.S. Unger. Het Inschrijvingsregister van der Kamer Zeeland der Verenigde Oost-Indische Compagnie. *Economisch Historisch Jaarboek*, 24:1–33, 1950.

Andrew von Nordenflycht. The Great Expropriation: Interpreting the Innovation of Permanent Capital at the Dutch East India Company. In Jonathan G. S. Koppell, editor, *Origins of Shareholder Advocacy*. Palgrave Macmillan US, 2011.