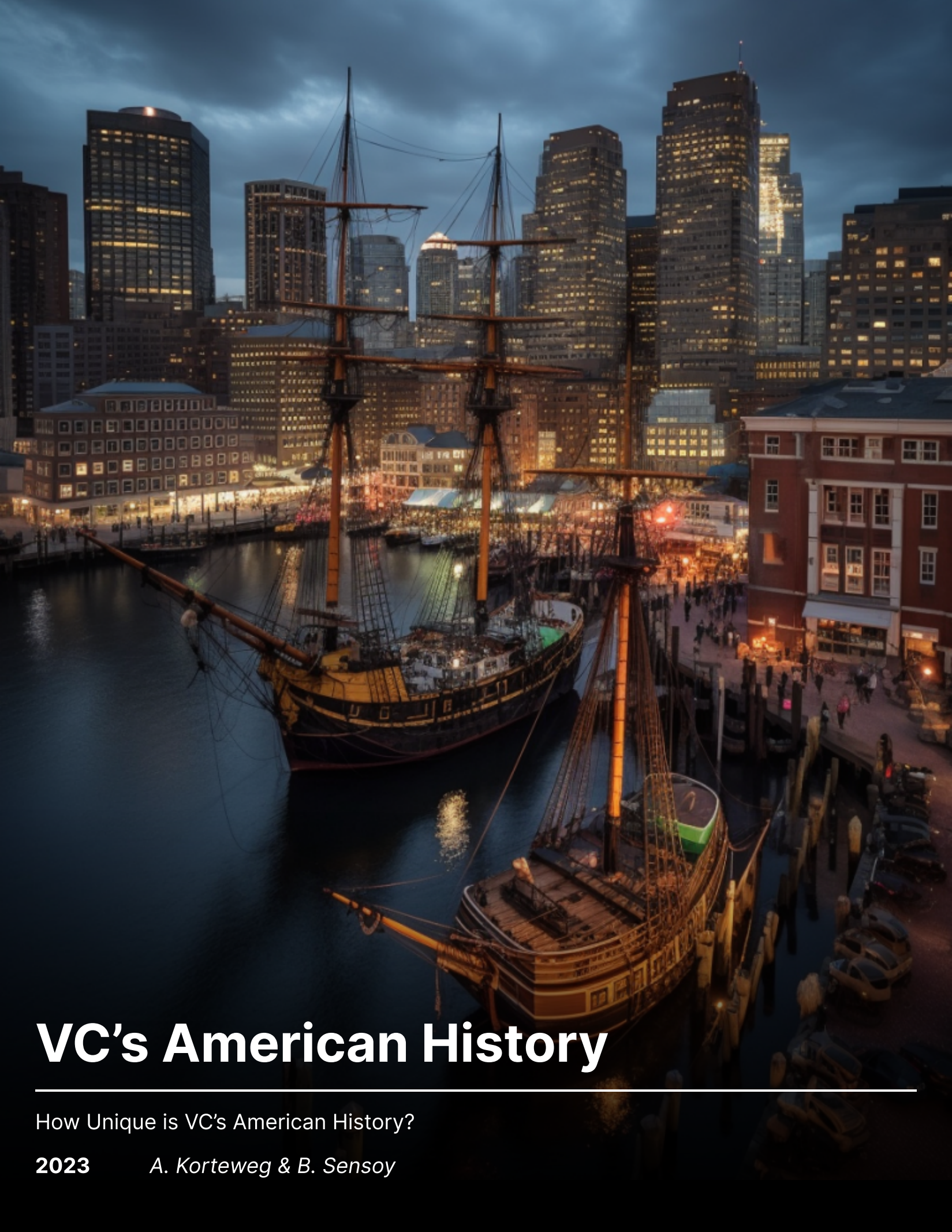

VC’s American History

How Unique is VC’s American History?

2023 *A. Korteweg & B. Sensoy*

How Unique is VC's American History?

ARTHUR KORTEWEG AND BERK SENSOY*

VC: An American History offers a compelling chronicle of the development of professional venture capital (VC) in the United States, from VC-like forebearers as diverse as 18th century cotton manufacturing and 19th century whaling up to the state of the modern VC market at the turn of the millennium. The book emphasizes America's enduring advantage in venture capital as a consequence of these early developments and as a practical governance solution for investing in the long-tailed returns of risky new ventures. In this essay we discuss similar historical precedent and governance arrangements in the spice trading voyages of the 16th and 17th century Dutch Republic, calling into question the uniqueness of the early American VC ancestors. Moreover, far from being a distinguishing feature of early ventures, long-tailed returns exist even in public equities, suggesting that the VC governance structure is about more than the distribution of returns. We conclude that the reasons for American dominance of contemporary VC remain unclear. Picking up where the book leaves off, we summarize facts and trends in 21st century venture capital.

(*JEL* G24, M13, N20, O16, O31)

* Korteweg: University of Southern California Marshall School of Business. Sensoy: Vanderbilt University Owen Graduate School of Management. We thank Abe de Jong, Bill Janeway, and Peter Koudijs for valuable comments and suggestions.

1. *Introduction*

Venture capital is an industry dedicated to financing startups, particularly innovative high-technology new ventures. VCs are not passive investors, but rather actively try to select the most promising new ventures and then assist their invested companies in realizing their potential. It is a high-risk business in which many, if not most, investments fail, and returns are concentrated among a relative handful of extraordinary successes. Despite the focus on startups, venture capital has an outsized influence on public equity markets and the real economy. In the United States, roughly half of companies that go public in an IPO are VC-backed, and the most successful VC-backed companies often dominate their respective industries. The five largest public companies in the United States as of August 2020 – Apple, Amazon, Microsoft, Alphabet (Google), and Facebook – were all VC-backed in their early days.

In VC: An American History, Tom Nicholas of Harvard University argues that venture capital "is largely an American invention" (p.1), and that America's unique current advantage in venture capital compared to the rest of the world can be traced to the uniqueness of some its American precedents, such as 19th century New England whaling and the early financing of industrial technology such as cotton spinning in the 18th century. The book describes these historical enterprises in great and fascinating detail, emphasizing their many similarities with modern VC.

A theme throughout the book is that the development of the VC industry and the structure and governance of VC investments can be understood through the lens of the allure of long-tailed, highly skewed returns, whereby sparse successes need to make up for a multitude of failures. Nicholas argues that skewed, long-tailed payoffs are a distinguishing feature of VC and its American antecedents and suggests that part of America's comparative success at VC may be due to Americans' relative affinity for such payoffs.

The book's first chapter, on whaling in the 1800s, explores these themes and sets the tone for the rest of the book. Like modern VC investments, 19th century whaling voyages were long-term projects that faced huge risks. Ships could be lost at sea or fail to find whales, and even completed voyages could have disappointing payloads. The result was a skewed, long-tailed distribution of returns similar to that of modern VC. The chapter explains the contracting mechanisms used to finance these voyages, which relied heavily on the intermediation of agents who developed relationships with ship captains in a bid to mitigate moral hazard and asymmetric information concerns. Nicholas discusses in detail the analogies of this intermediary function to the role of the modern venture capitalists, who intermediate capital between investors and entrepreneurs, relying strongly on relationships.

In the book's second chapter, Nicholas further explores the American historical precedents for the sophisticated contracting observed between VCs and their portfolio companies. These contracts carefully and separately divide rights over the control of the venture, such as board seats and veto powers, and rights over the division of profits to maximize the incentives of all

concerned. An additional mechanism VCs use to align incentives and reduce risk is to stage investments, with future rounds of funding available if the venture shows progress.

Nicholas explains that similar contractual and staging mechanisms were used to finance historically "high-technology" innovations in the U.S., drawing from the case of the wealthy Brown family of Providence, Rhode Island, who financed the cotton spinning innovations of Englishman Samuel Slater in the 1790s. The contractual arrangements between the Browns and Slater shared many of the features of VC contracts today, including staged investment, a large equity share subject to vesting for the owner of innovative human capital (Slater), and careful allocation of control rights and downside protections for the investors.

We agree with Nicholas's conclusion that the American historical precedents such as the financing of whaling and cotton spinning technology, and others detailed in the book, are highly related to modern VC. There is also little doubt that American VC has been uniquely successful in the world. However, it is less clear to us that the historical precedent is unique to the U.S., or even uniquely successful, making it difficult to draw a causal link between VC's American history and the success of modern U.S. venture capital.

For example, as we discuss in detail in Section 2 below, long-term and highly speculative commercial sea voyages were arranged elsewhere in the world even earlier than the American whaling voyages of the late 1800s. In particular, the Dutch in the 16th and 17th centuries established trading ventures to East Asia on a massive scale for the time. Like whaling, these earlier expeditions share many similarities with modern VC, including skewed, long-tailed returns and complex governance mechanisms. Yet a modern VC industry with similar success to the U.S. did not arise in the Netherlands.

We also agree that positively skewed, long-tailed returns are indeed a hallmark of VC. But long-tailed returns are by no means unique to VC. As we discuss in Section 4 below, long-tailed returns arise naturally as a consequence of long-term holdings of risky assets more generally, including for instance the returns of public equities if they are held for many years. Thus, it is difficult to ascribe too much of the governance and structure of VC to the long-tailed nature of its returns. Instead, as we discuss below, it is likely that the specific governance structures employed by venture capitalists have more to do with the value-added nature of the investment process, as opposed to the passive strategies seen in most other asset classes. While Nicholas does recognize that VCs arguably exist because they have informational advantages in the selection and governance of startups, this observation plays second fiddle to the return distribution emphasized in the book.

The middle part of the book largely traces the history of Silicon Valley as a hotbed for innovative companies and VC investments. Here, Nicholas describes the unique position Silicon Valley enjoys today as the result of an agglomeration over time of a number of factors, including returns to scale from academic innovation (largely from Stanford University), military investment, the presence of influential early firms that led to entrepreneurial spinoffs, the

weather, immigrants, and of course the development of the VC sector. What is much less clear is whether the agglomeration is simply due to serendipity. For instance, William Shockley founded Shockley Semiconductor in Silicon Valley because he happened to have a desire to move back to the San Francisco Bay area from the east coast to care for his ill mother. Departing employees from Shockley Semiconductor in turn founded Fairchild Semiconductor, Intel, and the VC firm Kleiner Perkins, among many others. Had Shockley Semiconductor instead been formed on the east coast, in many ways a more natural place at the time, the evolution of Silicon Valley could easily have been very different.

Nicholas also outlines the genesis of some of Silicon Valley's oldest and most successful VC partnerships. He stresses the different investment styles of the founding VCs. For example, Arthur Rock of Davis & Rock (later Venrock) emphasized investing in people, Tom Perkins of Kleiner Perkins focused on the technology, and Don Valentine of Sequoia Capital emphasized product markets. Each of these VCs was so successful that they are now legends in the VC community. Yet, given the disparity of styles, it is difficult to draw any firm conclusions about the makings of a good VC. Moreover, consistent with the long-tail distribution of returns, the reputation of each of these VCs was cemented largely on the basis of a few homerun investments, such as Kleiner Perkins's early investment in Genentech. It is difficult to rule out the possibility that these few early successes involved a large portion of luck, which became self-perpetuating because of increased access to the best new ventures (Nanda, Samila, and Sorenson 2020). If so, like the eminence of Silicon Valley itself, the early success of these top-tier VCs may have been serendipity.

The book ends its history with the technology boom of the late 1990s and the crash of the early 2000s. We offer some additional perspective on the nearly twenty years of VC since. We discuss VC performance from the perspective of portfolio companies, VC firms and partners, and the institutional investors that invest in VC funds. We also discuss the role of VC in contemporary society and the complementarities between public and private equity markets. We conclude with some thoughts on the future of VC in the U.S. and around the world.

2. *The Dutch Spice Trade: A Case Study*

Nicholas argues that the features of modern VC investing in the U.S. evolved from the way in which earlier American ventures were pursued, using the 18th century cotton-spinning and 19th century whaling industries in New England as key examples. However, these examples are not unique. Sophisticated contracting in illiquid, long-term investments with skewed, tail-risky returns was already commonplace in other parts of the world in earlier times. We explore the Dutch spice trade as an example.

The late 16th and early 17th centuries were a boom period for trade and economic growth in the newly established Dutch Republic. Starting in 1595, in part due to a supply shortage of pepper and in part in response to Dutch merchants being cut out of the spice trade, shipping

expeditions were sent out to explore trading opportunities in Asia. These expeditions were organized and financed through separate partnerships called pre-companies ("voorcompagnieën"). In 1602, to eliminate the intense competition between the pre-companies, they were merged into one firm, the Dutch East India company ("Vereenigde Oostindische Compagnie", or VOC).

2.1 *Risk and return*

Sailing to Asia and back around the southern tip of Africa was a risky and time-consuming business. Running aground, bad weather, capture by pirates or privateers, or acts of war could result in the loss of ship, cargo, and crew. Figure 1 shows the fate of the 92 voyages that departed the Republic In the first decade of the VOC's existence. Only 49 ships (53%) ultimately made it back safely. Eight ships (9%) were lost on the voyage to or from Asia (three on the trip to Asia and another five on the way back).[1] Once in Asia, many ships stayed in the region for a prolonged period of time, to support military efforts in the region. Of the 89 ships that arrived in Asia during the 1602 to 1612 period, 66 stayed for at least a year, and 35 of those never started the trip home, either because they met misfortune during their stay or because they remained in Asia on a permanent basis.

[Figure 1 here]

Even conditional on survival, the returns generated by a ship's voyage were volatile. The initial pre-company voyages of four ships in 1595 barely broke even. Later trips were considerably more lucrative. For example, the voyages of ships sailing from Amsterdam between 1595 and 1601 earned a 27% average annual return (Gelderblom, De Jong, and Jonker 2011). An eight-ship expedition that left the Republic in 1599 even made a 400% profit (Rickleffs 1991). Initially only silver was of real interest to the Asian trading partners, at least until the 1620s, when the company started to develop an intra-Asian trade network to generate profits from which to purchase spices. As a consequence, silver made up nearly half of the average Asia-bound cargo in the early years, most of the remainder being provisions and ship supplies for the voyage and equipment needed by the company to build up a presence abroad.

Besides uncertainty regarding the success of a voyage, there was also substantial variation in its duration. A round trip to Asia and back could take anywhere from 9 months to as long as 5 years. In the 1602 to 1612 period, the average duration without a prolonged stay abroad was 670 days, with a standard deviation of 210 days. For the ships that stayed in Asia for at least a year, the average round trip length was 1270 days, with a 245-day standard deviation. Even if a voyage's total profit were unaffected, a longer trip lowered the annualized returns of a given expedition. On top of that, longer trips were more expensive as a larger proportion of the silver cargo needed to be expended on provisions and wages. The ships themselves would also suffer

[1] This loss rate is quite representative: Based on data from Bruijn, Gaastra, and Schöffer (1987) for the period from 1602 to 1794 – nearly the entire 200 years of its existence – the VOC lost 7.9% of its ships on the outbound or homeward voyage.

substantially more depreciation, to the point of returning home at near salvage values (Gelderblom, De Jong, and Jonker 2013).

To gain further insight into the distribution of returns, we adapt a simulation from Gelderblom, De Jong, and Jonker (2019).[2] The exercise simulates 10,000 ship voyages, calibrated to data from VOC voyages initiated between 1602 to 1612 (this incorporates the loss probabilities from Figure 1 as an input). We describe the simulation procedure in detail in the appendix. Figure 2 shows the resulting distribution of annualized returns. For comparison, the Figure also includes the distribution of returns to venture capital investments in start-up companies that were first funded between 1987 and 2000. The similarities are evident: a large probability of a complete loss of invested capital, and a long, thin right tail of high positive returns that can exceed a hundred percent per year.[3]

[Figure 2 here]

2.2 *Organizational structure*

Nicholas posits that, while other historical examples of long-tailed returns do indeed exist, the way in which the 19th century U.S. whaling industry was structured resembles modern-day VC funds to a greater degree than earlier examples from other places. In particular, he stresses the pivotal role of agents who – like general partners in VC funds – acted as intermediaries to facilitate investment by wealthy individuals who did not possess detailed industry knowledge. The book also emphasizes the sophistication of the contracts used not only in whaling but also in eighteenth-century U.S. cotton-spinning, to align incentives and assign decision and property rights to maximize a venture's chance of success. When viewed in isolation it appears obvious that these examples are indeed significant innovations towards the way modern venture capital works. But a comparison to the structure of other, earlier examples, such as European maritime trade in the 16th and early 17th century, muddies these waters (pun intended).

In the analogy of Renaissance-era European maritime trade to modern entrepreneurship, the merchants are the entrepreneurs; they had ideas of where to trade and which goods to trade in, but limited capital. As early as the 12th century Venetian merchants formed general partnerships ("compagnias") with other merchants or shipmasters to organize trading voyages.

[2] We are grateful to Abe de Jong for generously sharing the simulation code from this paper.

[3] The high incidence of a -100% loss in the voyage simulations is in part due to counting 8 ships from the 1602-1612 expeditions that stayed in Asia permanently as total losses. If they are instead considered to have returned to the Republic, the frequency of a -100% return reduces by roughly 10 percentage points and the average annualized return is about 10 percentage points higher, but the key features of the distribution (a high total loss rate and long right tail) do not change. We also assume that invested capital only includes the ship's cargo. The simulation does not include wages or the equivalent rental cost of the ship. Since the ship can be thought of as capital stock (as it could potentially last for a number of voyages), the loss of a ship can be roughly compared to a manufacturer losing a factory. To keep the exercise tractable, this is not taken into account in our simulation. Including these additional costs would move the distribution to the left and compress it, but its skewed shape would be preserved.

These partnerships were set up for the purpose of a specific trade expedition.[4] Later innovations called "colleganzas" (also known as "commendas" outside Venice) allowed for capital provision by silent partners who were not active in the business and enjoyed limited liability (e.g., Puga and Trefler 2014). In return for providing capital, the silent partners earned a share of the voyage's profit, typically 75%, and the merchant kept the remaining 25%, referred to as carried interest. This terminology of carried interest has survived to modern VC.[5]

By the late 16th century, special-purpose limited liability partnerships were widespread throughout Europe (except for England, which did not recognize limited liability in partnerships). A common form of partnership arrangement in the Dutch Republic was the joint ownership of assets (ships in this case, though the structure was also used in other industries such as milling) in companies called "rederijen". With limited liability and ownership stakes as small as 1/132nd of a ship, such investments were accessible to small investors throughout the country. It was also common practice for suppliers to take payment at least in part if not in whole in the form of equity ownership (De Jong, Jonker, and Röell 2013). Shipless merchants who did not know which shipmaster to trust could call on local notaries, who served as matching agents (Gelderblom 2003).

Compared with earlier trade expeditions to closer-by destinations such as the Baltic, the Mediterranean, and West Africa, the pre-company voyages to Asia at the turn of the 17th century needed substantially more capital - two to four times the amount needed for a trip to Africa (Gelderblom and Jonker 2014). Much like the rederijen, the pre-companies were private, special-purpose, limited partnership-type vehicles that financed a single expedition at a time but had significantly more shareholders. They were governed by a rudimentary board of directors, who were effectively a small set of managing shareholders. The directors collected investments from other shareholders and used the cash to equip ships, hire crews, and purchase silver and possibly other trade goods to buy spices.

The organization of the pre-companies has many similarities, both economically and legally, to the present-day structure of venture capital funds. Like the pre-companies, VC funds are set up as partnerships with general partners (GPs) who – like the pre-company directors – do all the work from deal sourcing to managing the deal, and limited partners (LPs) who contribute capital but are not actively involved (Gelderblom and Jonker 2004). Second, the general partners earn a management fee for their efforts (1% in the pre-companies according to Gelderblom, 2003, versus typically 2% in VC funds). In addition, they have a significant equity

[4] Similar specific-purpose adaptations of the general partnership can be traced back to the "societas" of ancient Rome (see Zimmerman, 1996, p.457-459, and Malmendier, 2009).

[5] Carried interest earned by the VCs in contemporary venture capital is typically 20%, with some variation around this number. Some trace carried interest as far back as the biblical Old Testament. Specifically, the book of Genesis 47:23-24 reads: "Then Joseph said to the people, "Behold, I have this day bought you and your land for Pharaoh. Now here is seed for you, and you shall sow the land. And at the harvests you shall give a fifth to Pharaoh, and four fifths shall be your own, as seed for the field and as food for yourselves and your households, and as food for your little ones."

stake in the outcome. Third, the limited partners have limited liability, up to their initial investment, and only for the purpose and duration of the partnership (Gelderblom, De Jong, and Jonker 2011). Fourth, to the extent that the pre-companies owned the assets of the venture (ships and cargo), there was significant downside protection for the investors. In modern VC, downside protection comes in the form of "liquidation preferences" that entitle the VC to some multiple of their investment, usually one to three times, before any payments are made to founders or employees. Fifth, both the pre-company and VC fund partnerships have a limited lifetime, but limited partners cannot redeem their capital prematurely. In modern VC, when a portfolio company is sold or goes public, the proceeds are distributed to the limited partners. The partnership ends after 10 years, with some limited extension option if not all portfolio companies have been liquidated. In the pre-companies, when a ship returned, the pre-company directors sold its cargo and any other assets and distributed the proceeds to shareholders after withholding their fees, liquidating the partnership. The shareholders would then be offered the option to participate in the next voyage organized by the same directors (Gelderblom 2003), analogous to raising a next venture fund. The sixth and final similarity is that the general partners are not liable for missed capital calls, that is, if a limited partner does not pay up a promised share.

Notwithstanding these substantial similarities, there are a few important differences between the pre-companies and modern venture funds. In a VC fund the general partner's equity exposure comes primarily in the form of the carried interest profit share, while in the pre-companies their exposure was their direct equity stake in the underlying ventures.[6] Another difference is that the pre-companies lacked legal personhood. One consequence of this is that the partnership could not take on debt on its own account. Instead, the directors often borrowed on their personal account to help finance the preparation of a voyage. The other shareholders were not liable for this debt (Gelderblom, De Jong, and Jonker 2011). Regardless, debt at the fund level is uncommon in present-day VC (apart from subscription lines of credit, which are usually very small, see for example Albertus and Denes, 2020). Reporting practices also vary between the two types of organizations. Unlike the quarterly reporting frequency of modern VC funds, pre-companies did not release a full set of accounts until all goods had been sold, which could take two years or longer. Perhaps the most important difference of all, however, is that the pre-companies only funded a single voyage. In contrast, VC funds invest in a portfolio of startup companies, typically 20 (Metrick and Yasuda 2010).

The formation of the Dutch East India Company in 1602 addressed the lack of diversification across voyages within a partnership. From the outset the company was set up to have a 10-year limited life span, the same as a modern-day VC fund. In further similarity to venture funds, capital was called up in installments, which took place in 1603, 1604, 1605, and 1607 (Gelderblom and Jonker 2004). There was also some degree of pass-through of earnings,

[6] Modern-day general partners are also equity owners in their VC funds, but they typically only own around 1% of the fund (Robinson and Sensoy, 2013).

though not as complete as in modern VC: VOC shareholders were promised a dividend as soon as 5% of the original investment was returned from the sale of goods. After the expiration of the initial ten-year term, the VOC shareholders would receive their initial investment plus profits, and a new opportunity to invest for another ten-year period (Gelderblom, De Jong, and Jonker 2011).

While the VOC moved closer to modern venture capital in conception, not all these ideas ended up being implemented. The ten-year life was never actually enforced, as capital was later transformed into permanent capital. The 5% dividend also did not work out in practice (Irwin, 1991). An original proposal by Johan van Oldenbarnevelt, its principal architect, to have the VOC produce annual statements of sales and equipment costs, with full accounts published after ten years (Van Deventer 1862), was also not realized. Only the latter provision regarding full accounts made it into the charter, though the company did start producing annual sales and expense accounts in later years.

The ultimate transformation of the VOC into a permanent capital closed-end partnership with freely tradable shares resulted in a company that more closely resembled the American Research and Development Corporation (ARD) than a VC fund.[7] As described in the book, ARD was established in 1946 and is widely regarded as the forerunner of the modern venture capital funds. The firm most famously invested $70,000 in the Digital Equipment Corporation in 1957, an investment that was valued at over $355 million by 1971 (Nicholas 2019, p.129). On a related note, amidst pressure to relax the limited lifetime of the partnership model, there has been a recent trend towards longer-hold private equity funds. We revisit this issue in Section 4 below.

A final but crucial way in which the VOC diverged from the pre-companies as well as modern VC is that it quickly acquired quasi-governmental powers. Its charter granted the company a 21-year monopoly over all trade east of the Cape of Good Hope. The firm was also given the ability to pass and enforce its own laws, and even to engage in war (but not to declare war) with other nations. Nevertheless, the underlying voyages remained highly risky, as discussed above.

2.3 *Contracts and incentives*

The VOC had an elaborate incentive structure in place at all levels of the company. At the highest level, the directors of the chambers in the six VOC cities had a strong interest in maximizing dividends on account of their being shareholders. But the company also provided incentives to maximize revenue, with the intention of achieving a leadership position in the Stackelberg duopoly game it was playing against the English (Irwin 1991). Specifically, merchants were awarded on gross revenue rather than net profits (Steensgaard 1982, p.243).

[7] The VOC became the world's first formally listed public company and its shares were widely traded. By contrast, the British East India Company (chartered in 1600) was primarily financed with debt. Its shareholders, unlike those of the VOC, had no limited liability. The EIC did not become a genuine joint-stock company until 1657.

Captains and crew earned monthly wages, but various bonuses could be earned depending on the length of the voyage, the route taken, or other achievements. These bonuses were usually shared between the ship's captain and officers only. However, all crew were allowed to take private cargo on both the outbound and homeward voyage. This source of private income was extensively regulated. The higher a crewmember's rank, the more he was permitted to bring aboard (Bruijn 2011, chapter 11). The payoff of private trade, which could be quite substantial, was correlated with the success of the voyage, bringing an equity-like component to the crew's income. Moreover, there was a well-developed market in borrowing against future income through a financial instrument called a transport letter (Van Bochove and Van Velzen 2014). Sailors took these loans to generate upfront liquidity, and the added leverage increased the equity-like exposure of the regular crew. Finally, the prospect of future promotions within the Company, which came with sizeable returns, served as additional incentive to expend effort (e.g., Rei 2014).

2.4 *Intellectual property*

Venture capital revolves around the financing of innovation. Nicholas considers the 18th century U.S. cotton spinning industry as an example of (at the time) high-technology finance, and he describes the ways in which the sophisticated use of contracts to deal with agency problems resembles present-day VC deals. In contrast, the spice trade in the early 17th century in itself did not involve dramatic technological change. However, a key area of innovation during this time period was the discovery of new medicinal plants, in part to fight known diseases but also to combat previously unknown tropical afflictions. Several herbaria were assembled in the area of the Cape of Good Hope in the 1600s (Scott and Hewett 2008), which served as a replenishing station for VOC ships, and in South-east Asia (Baas and Veldkamp 2014). Most of the researchers were employed by the VOC. Their backgrounds varied: some were amateur botanists while others served as medical officers with extensive training in medicine and botany, given that these two disciplines were interwoven at the time.

The VOC valued the knowledge generated by these researchers. As early as the first VOC voyage in 1602, ship surgeons were instructed to collect specimens and illustrations to send back home.[8] An even stronger indication is the refusal of the company to publish the Ambonese herbal compiled by Rumphius during 1660 to 1690. It was not released for publication until 1741 (Baas and Veldkamp 2014). Notwithstanding this example, property rights appear to have been retained by the botanists themselves. Herbaria collected by Paul Hermann and Heinrich Oldenland around the Cape of Good Hope in the late 1600s went to their widows upon the botanists' untimely demise (Scott and Hewett 2008). The collections were sold by their families in subsequent years. While many clearly had a personal passion for herbology, the retention of property rights would have served as valuable additional incentive to embark on the labor-

[8] This was done at the request of Charles Clusius, a pioneering botanist and professor at the University of Leiden. Coincidentally, Clusius's study of tulips helped lay the foundation of the Dutch tulip industry, and also played a role in the famous Tulip mania episode of the 1630s.

intensive work of collecting, cataloguing, and preserving specimens. While this example is not nearly as detailed (or perhaps as compelling) as the 18th century contract regarding cotton-spinning technology described in Nicholas' book, it does show that the important roles of agency problems and incentive provision in innovation were already keenly appreciated in other places at earlier times.

To summarize and to conclude, the example in this section underscores that the developmental history of the U.S. VC industry should not be considered in a vacuum. While this brief treatment of the spice trade is by no means as in-depth and developed as the descriptions of whaling and cotton-spinning in the book, it serves to illustrate that many of the ingredients – a large opportunity set of risky ventures in need of funding, legal structure, financial intermediation, property rights, incentive systems – that spurred the birth and growth of the American venture industry, were also present in other parts of the world in earlier times (we should also note that while our focus is on one specific example, it is not unique and there are others, such as the Venetian trade in the Mediterranean that was briefly mentioned above, that could be highlighted just as well). On one hand this point by no means detracts from the fascinating historical observations offered in the book. Rather, it provides further context and puts them in a larger perspective. On the other hand, it does leave us with the question what exactly caused these other locations, with seemingly similar conditions and even similar institutions at some point in the past, to follow a different arc of history?

3. *The Ubiquity of Long-Tailed Returns*

As is evident from the previous section, historically there is a correlation between the long-horizon, long-tailed distribution of payoffs and the legal and governance structure of the industry that finances such projects. There are good economic reasons why this would be the case. At the same time, there are at least two observations that cast some doubt on the idea that it is the long-tailed returns per se that drive the structure of the U.S. VC system. The first is that VCs in other countries, while facing similar payoff distributions as their counterparts in the U.S., have adopted somewhat different financing and governance mechanisms. For example, European VCs are more likely to invest using common equity, rather than the complicated convertible preferred structure common in the U.S. (Bottazzi, Da Rin, and Hellmann 2004).

The second issue is that long-tailed distributions of returns appear to be ubiquitous in long-horizon investments in general, not just in the illiquid, private investments in startup companies that define venture capital. For example, Harvey and Siddique (2000) show that public equity returns in the U.S. are positively skewed, and that stocks with high coskewness with the market portfolio earn lower returns in expectation. The intuition for this result is that it is desirable for investors for a stock to rise more when the market rises than it falls when the market falls. In equilibrium, this attractive property is in high demand, which drives up the price and lowers the

expected return. This fact may also help explain why VC funds have not beaten the market on average over the past twenty years, an observation we return to in the next section.

Related to Harvey and Siddique, Bessembinder (2018) looks at the buy-and-hold returns of U.S. public equities since 1926. He finds that the majority of stocks underperform one-month Treasury Bills over their lifetime. The overall positive market returns of the last hundred years are due to just 4% of public equities. Bessembinder, Chen, Choi, and Wei (2019) find even starker results for public equities outside the U.S., where "less than one percent of firms account for $16 trillion in net wealth creation" while the majority of stocks underperform Treasuries. This evidence powerfully illustrates that public equities returns have a long-tailed distribution both inside and outside the U.S.

To see why long-tailed returns arise quite naturally for longer-horizon investments, consider an asset or security whose return for a single period spanning from time *t* to *t+1* is defined as $R_{t+1} = (P_{t+1} + D_{t+1})/P_t$, where P_t is the price at time *t* and D_{t+1} are dividends or cash flows generated by the asset between *t* and *t+1*. Define r_{t+1} as the natural logarithm of R_{t+1}. Let r_{t+1} have mean μ_{t+1} and variance σ^2_{t+1}, both finite for all *t*, and assume returns are independent across time. Assuming cash flows are reinvested into the asset, the long horizon return over the period from time *t* to *t+T* (with reinvested cash flows) is

$$R_{t,T} = \prod_{h=1}^{T} R_{t+h} = exp\left(\sum_{h=1}^{T} r_{t+h}\right)$$

If no individual period's variance dominates the sum of variances over the period (such that Lindeberg's condition holds) then the Central Limit Theorem implies that the sum in parentheses converges to a Normal distribution for long horizons (large *T*), with mean $\sum_{h=1}^{T} \mu_{t+h}$ and variance $\sum_{h=1}^{T} \sigma^2_{t+h}$. Therefore, $R_{t,T}$ converges to a lognormal distribution (see also Hakansson 1971).

To illustrate this result, we simulate one million investments in an asset whose one-year returns (R_{t+1}) are Normally distributed with an annual mean of 10% and standard deviation of 30% (with returns below -100% set to -100%). Panel A of Figure 3 shows the shape of this distribution. These assumptions are loosely calibrated to reflect individual stock returns. For example, Ang et al. (2009) show that the annual volatility of individual stocks returns ranges from 27% to 57% across countries, with European stocks at the lower end and North American stocks at the higher end of the range.

To obtain long-horizon returns, we simulate ten years of annual returns for each investment, sampled independently from the distribution of one-year returns. We then compute the ten-year return for every investment by compounding their one-year returns. The resulting distribution, in Panel B of Figure 3, is very close to a lognormal distribution. It has a long right tail, but it does not appear to have the mass of failed investments that is characteristic of VC (as seen in Figure 2). However, this is somewhat of an artifact of the

definition of failure: few investments end up at exactly zero value, but many have very low valuations at the end of the decade. Cochrane (2005) develops a return model for VC-backed start-ups and estimates that firms start to go out of business when their worth drops below 25% of their initial value. For tractability, we take a simple approach and recompute the ten-year returns using the same simulated returns as in Panel B but assuming that the investor liquidates her position in the asset as soon as she loses 75% of the initial investment (that is, as the compounded return hits -75%). With this modification, Panel C shows that the hallmark "failure" mass appears very prominently at the left end of the distribution.

The insight that long-horizon returns are positively skewed is quite general. It holds for almost arbitrary short horizon returns (subject to the mild regularity conditions described above). Even negatively skewed annual returns will produce positively skewed long horizon return given a long enough time frame. Returns also do not need to be independent over time, as the Central Limit Theorem still holds under certain mixing conditions.

The ubiquity of right-skewed, long-tailed returns coupled with the fact that we do not see a similar structure to VC in (long-term) investments in most asset classes, suggests that the distribution of returns in VC is not the key reason why the industry has adopted its present structure, or why it has boomed in the U.S. specifically. This begs the question what other factors may be at play. Some authors point to the U.S. tax system as a contributing factor (e.g., Gilson and Schizer 2003, Fried and Ganor 2006), but others have pointed out that sophisticated VCs in countries with different tax rules still use similar security designs (e.g., Kaplan, Strömberg, and Martel 2004). A more compelling argument for the U.S. government's role is its funding of basic research, especially in the mid-20th century through the National Institutes of Health and Department of Defense.[9] Still, fundamental economic forces, especially related to agency problems, offer the most promising explanations for the VC industry's structure we see today.

For example, the long incubation period of new ventures, during which it is difficult to transfer ownership without severe adverse selection issues, is likely a key reason why limited partners cannot redeem their investments from VC funds. The importance of VCs as active investors that add value to their portfolio companies serves to exacerbate this problem. The book explains that the ability to identify and nurture potential homerun investments is a critical skill for would-be venture capitalists, and how modern VC investment contracts give VCs control rights well in excess of their ownership stake in the firm. Often, VCs are effectively in control given their board seats and veto rights, highlighting their importance to their portfolio companies. This necessitates the continued involvement of, and effort provision by, the VCs with the companies they invest in.

[9] Bill Janeway discusses the government's role in the rise of Silicon Valley in more depth in this review: https://www.project-syndicate.org/onpoint/the-making-of-the-digital-revolution-by-william-h-janeway-2020-02.

One might argue that in public firms, which have longer track records and predominantly passive investors, shareholders also cannot redeem their investment from the company at will. However, shareholders are able to sell their ownership stake to other investors quickly and without incurring large transaction costs. Why could investors in VC funds not transfer their stake in VC funds to others, even if it is highly inefficient for VCs to liquidate their investments in portfolio companies prematurely? As it turns out, such sales do occur, but they can take as long as six months to complete and are typically executed at sizeable discounts to a fund's Net Asset Value (Nadauld et al. 2019). One reason why volume in this market is low is because it is difficult to value the fund, since its investments are in early stage ventures whose trajectories are hard to predict. In fact, this is one argument in favor of the limited lifetime of VC funds: there needs to be a final reckoning at some point to truly tell how the VC has performed. Without fund liquidation, the potential for Ponzi type schemes looms large. Still, the secondary market in LP stakes has increased dramatically in size and volume over the last two decades and continues to grow year over year. The next section discusses how these, and other trends are reshaping the VC landscape beyond the developments identified in the book.

4. *Venture Capital Trends in the New Millennium*

The book ends with a description of the dot-com era in VC, the run-up of the late 1990s and crash in March of 2000. Since then, the markets for venture capital and the financing of entrepreneurship have seen additional, qualitatively important trends, including a marked increase in the supply and demand of private capital and increased concentration of the best entrepreneurial firms, and best returns, amongst a few high-profile VC groups. In this section we discuss the trends of the last twenty years and our expectations for the future of VC.

4.1 Increases in VC Supply and Demand

It is often argued that investors in VC and other forms of private equity should expect higher returns (a risk premium) for the illiquidity they suffer, in addition to the normal risk premium associated with equity investments in small, high-growth companies. The hopes of higher-than-ordinary expected returns are also bolstered by the value-added investment process itself. If a VC is skilled at identifying and growing high-potential startups, it is reasonable to think that LP returns will be high.

Attracted by the potential for higher returns, institutional investor interest in VC has increased a great deal since the turn of the 21st century, part of a pattern of increasing interest in "alternative" asset classes – those other than traditional public equities and bonds (Cavagnaro et al. 2018). This pattern has been strengthened by the low interest rates and high public equity valuations since the 2008-2009 financial crisis, which has dampened enthusiasm for traditional bonds and public equity, especially among underfunded pension plans and other institutions with spending mandates, such as university endowments.

The increased supply of funding for venture capitalists has been matched by increases on the demand side of innovative private firms requiring financing. There have been several drivers for this increase in demand. One is increasing opportunities for innovation in technology and lower costs of business formation in sectors such as software (Ewens, Nanda, and Rhodes-Kropf 2018). Another shift has taken place in VCs' propensity to take their portfolio companies public. In the tech boom of the late 1990s, VC-backed companies that went public often did so while still quite young. Since then, the number of publicly listed companies has fallen dramatically even while public stock market capitalization has increased substantially. Today's public firms are fewer and larger than those of 2000. Meanwhile, private companies, including VC-backed ones, are staying private longer and going public later in life (Ewens and Farre-Mensa 2020), driven by both the increased supply of private capital as a substitute for public equity and increased sensitivity to the costs of being public, such as regulations and analyst coverage. These trends are captured in the recent phenomenon of the fabled "unicorns", the once exceedingly rare startups with a $1 billion valuation while private. Unicorns are no longer rare, and the large increases in value they represent help fuel institutional demand for investments in venture capital.

Consistent with the increasing supply and demand forces, the number of venture capital firms and funds, the amount of capital they have raised, and the number of startups receiving VC have all increased sharply over the past 20 years, and especially in the immediate past decade (Harris, Jenkinson, and Kaplan 2016; Lerner and Nanda 2020). Yet the consequences of this activity for LPs, GPs, invested companies, and society as a whole remain hotly debated.

4.2 Returns

For institutional investors seeking higher returns, it is ironic that the very features of venture capital that lead to optimism about the potential for high returns – illiquidity and a long-term, value-additive investment process – greatly complicate assessment of whether this potential is realized. The chief difficulty is that periodic and objective market prices are not available by definition of being private investments, as mentioned in Section 3. It is impossible to know for certain the true value of the startup companies invested by a venture capital fund at any given point in time, all the more so considering that the value of the company is likely to change depending on the value-added abilities of its investors, so any transaction price will depend in part on the identities of the buyer and seller. This situation is in stark contrast to that of mutual funds, for which daily market prices are available based on the market prices of their (publicly-traded) holdings.

The lack of periodic market prices means that the standard tools that financial economists use to assess risk and return are not available. The standard framework is to regress periodic (e.g., daily or monthly) returns of some portfolio of assets (such as a mutual fund) on the returns of one or more factor portfolios. The factor portfolios are designed to capture sources of systematic risk that influence expected returns. Loadings on factor portfolios are interpreted as the risk exposures of the portfolio in question and the intercept of the regression indicates

outperformance or underperformance given the risk factor exposures. Without periodic market prices for the portfolio of interest, such as a venture capital fund, the basic input for this sort of analysis, periodic returns, cannot be constructed.

Instead, inferences about venture capital fund performance must be made based on cash flows into (capital calls, for making investments and paying management fees to the VCs) and out of (representing distributions from exited investments net of the carried interest) the fund. Even here, data limitations are important. VC funds are not subject to public disclosure rules, so researchers are limited to GPs or LPs that either voluntary report their cash flows or, in the case of some LPs such as public pension funds, are subject to Freedom of Information Act requests. Nevertheless, the past twenty years have seen tremendous improvement in the quality and quantity of VC cash flow data available for research. Today, most researchers use datasets from Preqin and/or Burgiss. The latter is more comprehensive but is anonymized which rules out some research questions.

With cash flows, it is possible to construct measures of fund-level performance, that is, cumulative performance over the life of the fund (approximately ten years). A common measure in the industry is simply the ratio of total distributions to total capital calls, known as the TVPI (total value to paid in capital) or MOIC (multiple of invested capital). The TVPI measures performance by asking how many dollars an LP received over the life of the fund for each dollar invested. Although intuitive, this measure does not account for any notion of risk or even for the time value of money. Moreover, since the TVPI can only be measured once per fund, reflecting aggregate performance over the entire life of the fund, it is difficult to determine whether even a high TVPI reflects venture capital skill, luck, normal compensation for risk, or some combination of these. Regardless of the interpretation, for investors to achieve a high TVPI at all faces substantial headwinds in the form of management fees. For instance, with a management fee of 2% per year and carried interest of 20% of profits, a net-of-fee TVPI of 1.0 (meaning the investors gets back exactly what they put in) requires a gross-of-fee TVPI of 1.25. Assuming a five-year investment holding period and the same fee structure, a gross-of-fee TVPI of 1.25 is equivalent to a gross-of-fee internal rate of return (IRR) of 4.56%, all of which is captured by fees, leaving a 0% IRR for investors. More generally, Metrick and Yasuda (2010) estimate that the managers of the median VC fund receive $22.84 in management fees and carried interest for every $100 of fund size.

To partially correct the shortcomings of no risk or time-value-of-money adjustment, most inference about venture capital returns is made using the PME, or public market equivalent, measure. The PME, pioneered in academic work by Kaplan and Schoar (2005), is calculated in the same way as the TVPI, except each cash flow is first discounted (divided) by the total return on the public market index from the date of fund inception to the date of the cash flow. The PME can be thought of as a market-adjusted TVPI, where the multiple earned by the VC fund is compared to the multiple that would have been earned by a similarly timed investment in the public equity markets. Most academic studies use the S&P 500 as the market index for PME

purposes, despite the fact that the types of firms invested by venture capitalists are quite different (notably, smaller) than S&P 500 firms. Alternative public market indexes include the Nasdaq composite, because its technology focus is compatible with VC-backed startups, and the Russell 2000 index of small capitalization stocks (Harris, Jenkinson, and Kaplan 2014).

Armed with the PME, recent studies have assessed the performance of VC funds. After the tech boom of the late 1990s, VC fund performance to LPs has, for the most part, matched public markets at best (Harris, Jenkinson, and Kaplan 2016, Korteweg and Nagel 2016), which is disappointing for those hoping for a liquidity premium or for value-added VC skill to filter into LP returns. To the extent that VCs add value, the empirical evidence is consistent with an equilibrium in which VCs capture the value-add through their fees, leaving little on the table for LPs. For example, Korteweg and Sorensen (2017) show that there is persistence in net-of-fee returns but it is difficult to capitalize on. Moreover, while LPs do appear to have differential skill and/or access in their VC investments, as evidenced by the systematic differences in the performance of VC portfolios across LPs, these differences have shrunk dramatically over time (Cavagnaro et al., 2018). At the same time, the results are also consistent with the view that the flows of new capital to VC over time, the entry of new VCs, and learning about the VC investment process have combined to increase competition within VC and commoditize returns.

The exception to this general state of VC performance lies with a few top-tier partnerships, such as those emphasized in the book's history of Silicon Valley. Groups such as Sequoia and Kleiner Perkins have continued to outperform public markets and the VC industry on a net-of-fee basis through the present day. One explanation for the continued outperformance is simply that these organizations have successfully cultivated and passed down over the years the skills necessary for VC success and these skills are quite rare and hard to duplicate. Another possibility Is that these groups made their reputations early with a few homeruns such as Intel and Apple, as described in the book, and subsequently have their pick of the best entrepreneurs regardless of any actual difference in value-added skill.

Whatever the reason, the bifurcation of VC returns to LPs, whereby a few top groups outperform while the rest of the industry struggles to match public markets, has been accompanied by other shifts in the VC landscape. One of these is the concentration of capital. Although the number of VC firms and funds have grown substantially, capital is increasingly concentrated in the top venture groups. These groups in turn have increasingly limited access to their funds to select LPs, such as endowments of top private universities. As a result, the bulk of VC investment activity and returns are limited to a relative handful of top GPs and the LPs fortunate enough to have invested with them (see Lerner and Nanda 2020 for a summary of some of these issues). This leaves the question why these VCs do not further raise their fees to capture more of their own value-add, given the strong demand from LPs. To properly explore this issue requires a separate investigation that we do not pursue here, leaving the facts as they are.

With respect to the basic structure of VC funds, given the trend in companies staying private longer, recent years have seen upward pressure on the traditional 10-year partnership life, with longer-lived or even evergreen funds with no set end date becoming more common (Whyte 2017). Further, one of the advantages of the limited partnership form, well-covered in the book, is the ability to tax profits at capital gains tax rates, which have historically been significantly lower than corporate income tax rates. However, the Tax Cut and Jobs Act of 2017 lowered the corporate tax rate to approximately the capital gains rate, lessening the advantage of the limited liability partnership over a standard corporate structure. Since corporations are infinitely lived, the legal structure of VC funds may be more fluid in the future. There are already some early signs of this in the broader private equity industry, with some partnerships such as Blackstone converting to C corporations.

These trends present a dilemma for LPs, at least those without access to the top VC groups. On the one hand, high public equity valuations coupled with later initial public offerings suggest potential from private investments in young companies, yet the accessible set of VC partnerships tend not to have a track record of success. In some cases, LPs are achieving these investments through what have traditionally been public equity investment vehicles such as mutual funds and hedge funds. In other cases, LPs have pressed for lower fees or access to alternative vehicles and co-investments with more opportunity for making a profit on their investment.

4.3 The future

In our view, the rise of private capital is here to stay, and will probably continue to intensify in the foreseeable future. The concentration of returns among the top venture capital groups is arguably self-perpetuating, as the most promising entrepreneurs are drawn to the groups with the best reputations. There is no question that VC plays a valuable, even critical role in driving technological progress and wealth creation in the economy. For instance, and to circle back to the introduction, as of this writing, the five largest publicly traded companies in the US are Apple, Amazon, Microsoft, Facebook, and Alphabet. All five were VC-backed as startups. Yet this very success does exacerbate inequality in society, as much of the financial benefits flow to a relative handful of VCs and entrepreneurs. We also share the concerns of Lerner and Nanda (2020) regarding the dangers of the venture capital industry's role as gatekeeper to the finance of entrepreneurship, particularly in light of the industry's historical struggles with diversity.

On the regulatory side, there is a growing movement to increase access to private capital markets by allowing defined contribution retirement plans to offer private equity and venture capital options. This could potentially improve regulatory oversight and increase transparency of private capital markets. But at this stage it is too early to tell whether these plans will become reality, and what form any regulation by the Securities and Exchange Commission might take. Time will tell.

5. *Conclusion*

VC: An American History delivers on its promise to relay the history of venture capital in the United States. Nicholas presents a fascinating narrative of the investors in high-technology and risky ventures, and how they structured these investments, from as far back as the 18th century until the turn of the millennium. What the book leaves underexplored is the wider international historical context in which the American story plays out, as well as a broader discussion of the distinguishing factors that make VC unique as an asset class compared to other investment opportunities.

We analyze the example of the 16th century Dutch spice trade to show that the organization, both economically and legally, of these comparably risky ventures bears many similarities to modern VC, underscoring that there were precedents that set the stage for the U.S. experience. Further, we show that it is unlikely that the long-tailed property of VC returns is the principal feature that drives the structure of the industry and the types of contracts negotiated between VCs and entrepreneurs, as argued in the book. In fact, the probability distribution of long-horizon returns tends to be positively skewed under general conditions. We conjecture that the active involvement of venture capitalists with the companies they invest in, the agency problems involved, and the resulting illiquidity of the VCs' investments, have pushed the industry towards the structure we see today.

We ended our review with a summary of key developments in the VC industry in the last twenty years, and a few speculations regarding its future. One final prediction that we can confidently make is, if the last 300 years of venture investing are any indication, the next 300 years are bound to be exciting and full of surprise.

Appendix: Simulation of Dutch East India Company Ship Voyages

We simulate annualized returns from 10,000 round-trip voyages from the Dutch Republic to Asia, calibrated to data between 1602 and 1612. The probability of surviving the outbound voyage is 96.6% (based on 89 out of 92 ships arriving in Asia in the data). Of these arrivals, 25.8% (23 out of 89 ships) return back to the Republic within a year, while the remaining 74.2% (66 out of 89) have an extended stay for at least a year. For those returning within a year, there is a 4.5% chance of being lost on the homeward voyage (based on 1 out of 22 lost ships in the data; this number is not separately broken out in Figure 1). Of the ships that remain in Asia for over a year, the probability of never making it back to the Republic is 59% (39 out of 66 ships; based on 20 ships being lost in Asia, 8 ships staying permanently, 4 ships being lost on the trip home, and 7 that met an unknown fate).

We assume that a ship's silver load is 44.6% of its cargo value, the average for 1602-1612 from Gelderblom, De Jong, and Jonker (2013) appendix Table 1 (this proportion is quite stable; the average over 1602 to 1622 is 42.7%). Following Gelderblom, De Jong, and Jonker (2019), we

assume the sale value of purchased spices is a multiple of the silver value equal to 2.5, 3, or 3.5, with equal probabilities. If a ship does not return to the Republic, then the sale value is set to zero.

To compute annualized returns, we also need to simulate the duration of each voyage. Calibrating to expeditions from 1602 to 1612, as in Gelderblom, De Jong, and Jonker (2019), the round trip length for a return trip without a prolonged stay in Asia is drawn from a Normal distribution with a mean of 669.84 days and a standard deviation of 209.62 days, winsorized at a minimum of 246 days. Conditional on a stay abroad of at least one year, round trip durations are sampled from a Normal distribution with a mean of 1270.41 days, a standard deviation of 245.39 days, and a minimum of 941 days.

The annualized return for a completed voyage is then computed as the silver percentage times the realized sales multiple, raised the reciprocal of the duration, minus one. Note that for ships that do not make it back to the Republic, the return is -1 (or, in percentage terms, -100%).

REFERENCES

Albertus, James F., and Matthew Denes. 2020. "Private Equity Fund Debt: Capital Flows, Performance, and Agency Costs." Carnegie Mellon University Working paper.

Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang. 2009. "High Idiosyncratic Volatility and Low Returns: International and Further U.S. Evidence." *Journal of Financial Economics* 91 (1):1-23.

Baas, Pieter, and Jan Frits Veldkamp. 2014. "Dutch Pre-colonial Botany and Rumphius's Ambonese Herbal." *Allertonia* 13: 9-19.

Bessembinder, Hendrik. 2018. "Do Stocks Outperform Treasury Bills?" *Journal of Financial Economics* 129 (3): 440-457.

Bessembinder, Hendrik, Te-Feng Chen, Goeun Choi, and K.C. John Wei. 2019. "Do Global Stocks Outperform US Treasury Bills?" Arizona State University and Hong Kong Polytechnic University Working paper.

Bottazzi, Laura, Marco Da Rin, and Thomas Hellmann. 2004. "The Changing Face of the European Venture Capital Industry: Facts and Analysis." *Journal of Private Equity* 7(2): 26-53.

Bruijn, Jaap R. 2011. *Commanders of Dutch East India Ships in the Eighteenth Century.* Woodbridge, UK: The Boydell Press.

Bruijn, Jaap R., Femme S. Gaastra, and Ivo Schöffer. 1979-1987. *Dutch-Asiatic Shipping in the 17th and 18th centuries.* 3 vols. The Hague: Nijhoff.

Cavagnaro, Daniel R., Berk A. Sensoy, Yingdi Wang, and Michael S. Weisbach. 2018. "Measuring Institutional Investors' Skill at Making Private Equity Investments." *Journal of Finance* 74 (6): 3089-3134.

Cochrane, John H. 2005. "The Risk and Return of Venture Capital." *Journal of Financial Economics* 75(1):3-52.

De Jong, Abe, Joost Jonker, and Ailsa Röell. 2013. "Dutch Corporate Finance, 1602-1850." In *Handbook of Key Global Financial Markets, Institutions, and Infrastructure*, Vol. 1, edited by Gerard Caprio, 73-83. Oxford: Elsevier Inc.

Ewens, Michael, and Joan Farre-Mensa. 2020. "The Deregulation of the Private Equity Markets and the Decline in IPOs." *Review of Financial Studies*, forthcoming.

Ewens, Michael, Ramana Nanda, and Matthew Rhodes-Kropf. 2018. "Cost of Experimentation and the Evolution of Venture Capital." *Journal of Financial Economics* 128 (3): 422-442.

Fried, Jesse M., and Mira Ganor. 2006. "Agency Costs of Venture Capitalist Control in Startups." *New York University Law Review* 81 (3): 967-1025.

Gelderblom, Oscar. 2003. "The Governance of Early Modern Trade: The Case of Hans Thijs, 1556-1611." *Enterprise & Society* 4 (4): 606-639.

Gelderblom, Oscar, and Joost Jonker. 2004. "Completing a Financial Revolution: The Finance of the Dutch East India Trade and the Rise of the Amsterdam Capital Market, 1595-1612." *Journal of Economic History* 64 (3): 641-672.

Gelderblom, Oscar, Abe de Jong, and Joost Jonker. 2011. "An Admiralty for Asia. Isaac le Maire and Conflicting Conceptions About the Corporate Governance of the VOC." In *The Origins of Shareholder Advocacy*, edited by Jonathan G. S. Koppell, 29-60. New York: Palgrave Macmillan.

Gelderblom, Oscar, Abe De Jong, and Joost Jonker. 2013. "The Formative Years of the Modern Corporation: The Dutch East India Company VOC, 1602-1623." *Journal of Economic History* 73 (4): 1050-1076.

Gelderblom, Oscar, Abe De Jong, and Joost Jonker. 2019. "Learning how to Manage Risk by Hedging: The VOC Insurance Contract of 1613." *European Review of Economic History* 24 (2): 332-355.

Gilson, Ronald J., and David M. Schizer. 2003. "Understanding Venture Capital Structure: A Tax Explanation for Convertible Preferred Stock." *Harvard Law Review* 116 (3): 874- 916.

Hakansson, Nils H. 1971. "Multi-Period Mean-Variance Analysis: Toward a General Theory of Portfolio Choice." *Journal of Finance* 26 (4): 857-884.

Harris, Robert S., Tim Jenkinson, and Steven N. Kaplan. 2014. "Private Equity Performance: What Do We Know?" *Journal of Finance* 69 (5): 1851-1882.

Harris, Robert S., Tim Jenkinson, and Steven N. Kaplan. 2016. "How Do Private Equity Investments Perform Compared to Public Equity?" *Journal of Investment Management* 14 (3): 14-37.

Harvey, Campbell R., and Akhtar Siddique. 2000. "Conditional Skewness in Asset Pricing Tests." *Journal of Finance* 55, 2000 (3): 1263-1295.

Irwin, Douglas A. 1991. "Mercantilism as Strategic Trade Policy: The Anglo-Dutch Rivalry for the East India Trade." *Journal of Political Economy* 99(6): 1296-1314.

Kaplan, Steven N., and Antoinette Schoar. 2005. "Private Equity Performance: Returns, Persistence, and Capital Flows." *Journal of Finance* 60 (4): 1791-1823.

Kaplan, Steven N., Per Strömberg, and Frederic Martel. 2004. "How Do Legal Differences and Learning Affect Financial Contracts?" University of Chicago, Working paper.

Korteweg, Arthur, and Morten Sorensen. 2010. "Risk and Return Characteristics of Venture Capital-Backed Entrepreneurial Companies." *Review of Financial Studies* 23(10): 3738-3772.

Korteweg, Arthur, and Stefan Nagel. 2016. "Risk-Adjusting the Returns to Venture Capital." *Journal of Finance* 71 (3): 1437-1470.

Korteweg, Arthur, and Morten Sorensen. 2017. "Skill and Luck in Private Equity Performance." *Journal of Financial Economics* 124 (3): 535-562.

Lerner, Josh and Ramana Nanda. 2020. "Venture Capital's Role in Financing Innovation: What We Know and How Much We Still Need to Learn." *Journal of Economic Perspectives* 34 (3): 237-261.

Malmendier, Ulrike. 2009. "Law and Finance "At the Origin"." *Journal of Economic Literature* 47(4): 1076-1108.

Metrick, Andrew, and Ayako Yasuda. 2010. "The Economics of Private Equity Funds." *Review of Financial Studies* 23(6): 2303-2341.

Nadauld, Taylor D., Berk A. Sensoy, Keith Vorkink, and Michael S. Weisbach. 2019. "The Liquidity Cost of Private Equity Investments: Evidence from Secondary Market Transactions." *Journal of Financial Economics* 132 (3): 158-181.

Nanda, Ramana, Sampsa Samila, and Olav Sorenson. 2020. "The Persistent Effect of Initial Success: Evidence from Venture Capital." *Journal of Financial Economics* 137 (1): 231-248.

Nicholas, Tom. 2019. *VC: An American History*. Cambridge, MA: Harvard University Press.

Puga, Diego, and Daniel Trefler. 2014. "International Trade and Institutional Change: Medieval Venice's Response to Globalization." *Quarterly Journal of Economics* 129(2): 753-821.

Rei, Claudia. 2014. "Careers and Wages in the Dutch East India Company." *Cliometrica* 8: 27-48.

Ricklefs, Merle C. 1991. *A History of Modern Indonesia Since c. 1300*. London: MacMillan.

Robinson, David T., and Berk Sensoy. 2013. "Do Private Equity Fund Managers Earn Their Fees? Compensation, Ownership, and Cash Flow Performance." *Review of Financial Studies* 26(11): 2760-2797.

Scott, Gillian, and Margaret L. Hewett. 2008. “Pioneers in ethnopharmacology: The Dutch East India Company (VOC) at the Cape from 1650 to 1800.” *Journal of Ethnopharmacology* 115 (3): 339-360.

Steensgaard, Niels. 1982. “The Dutch East India Company as an Institutional Innovation.” In *Dutch Capital and World Capitalism*, edited by Maurice Aymard, 247-250. Cambridge: Cambridge University Press.

Van Bochove, Christiaan, and Ton van Velzen. 2014. “Loans to Salaried Employees: The Case of the Dutch East India Company, 1602-1794.” *European Review of Economic History* 18 (1): 19-38.

Van Deventer, Marinus Lodewijk. 1862. *Gedenkstukken van Johan van Oldenbarnevelt en Zijn Tijd, II, 1593-1602*. The Hague: Nijhoff.

Zimmermann, Reinhard. 1996. *The Law of Obligations. Roman Foundations of the Civilian Tradition.* Oxford: Oxford University Press.

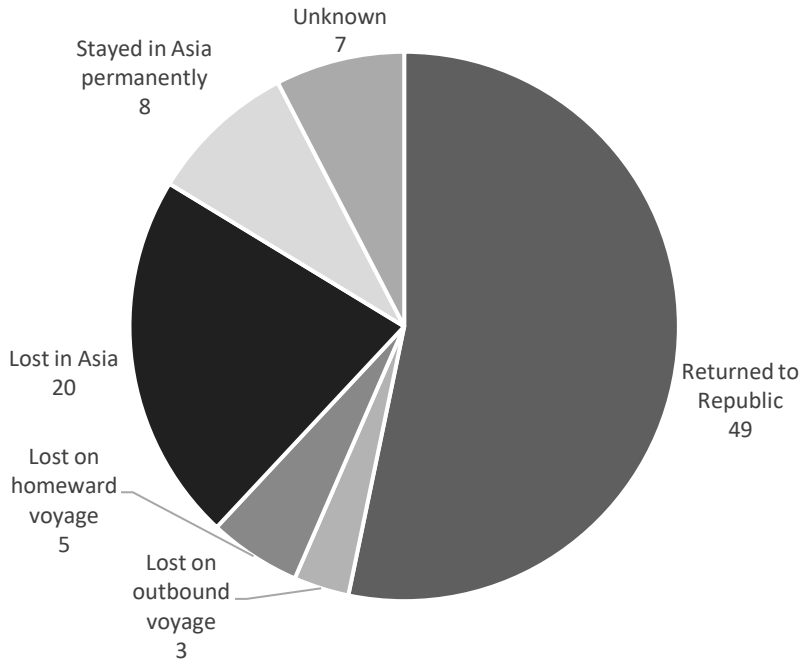

Figure 1. Distribution of Outcomes of Dutch East India Company (VOC) Voyages

Notes: Distribution of outcomes of 92 Dutch East India Company voyages that departed the Dutch Republic between 1602 and 1612. Numbers represent the count of ships for each outcome. Of the 20 ships lost in Asia, 9 were shipwrecked, 7 were lost due to warfare, 2 were broken up, and 2 were lost out of sight. Source: Bruijn, Gaastra, and Schöffer (1987) and Gelderblom, De Jong, and Jonker (2019).

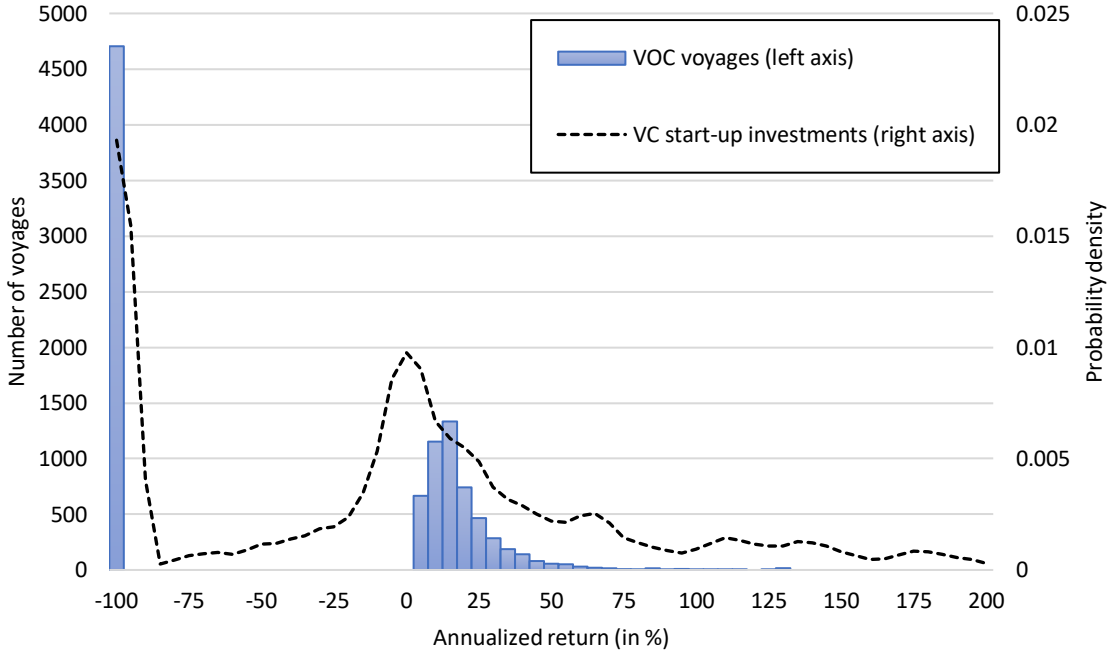

Figure 2. Returns to Simulated VOC Voyages.

Notes: Histogram of annualized returns (in %) of 10,000 simulated Dutch East India Company (VOC) voyages. Simulation inputs are based on data for 92 VOC voyages that departed the Dutch Republic between 1602 and 1612, sourced from Bruijn, Gaastra, and Schöffer (1987) and Gelderblom, De Jong, and Jonker (2019). For comparison, the dashed line is the kernel-smoothed distribution of annualized returns from first investment to exit (initial public offering, acquisition, or failure) for venture capital investments in start-up companies first funded between 1987 and 2000, based on Korteweg and Sorensen (2010). Exit data runs until the end of 2005.

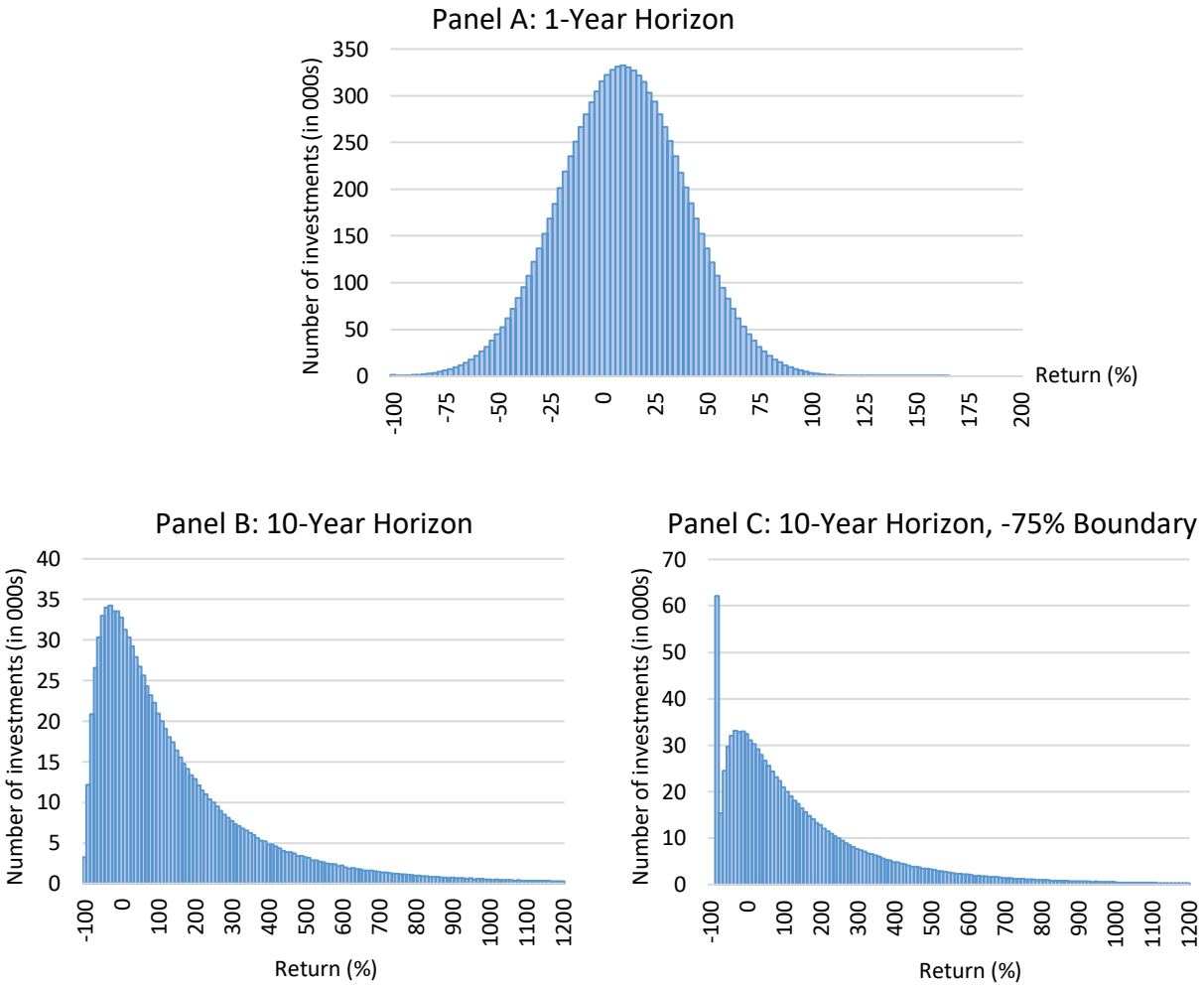

Figure 3. Short and Long-horizon Return Distributions

Notes: Histograms of returns of 1 million investments in an asset whose annual returns are sampled from an independent Normal distribution with a mean of 10% per year and standard deviation of 30% per year. Returns below -100% are set to -100%. Panel A shows the distribution of 1-year returns. Panel B shows the distribution of the (non-annualized) return over a 10-year horizon (computed by compounding 10 returns sampled from the annual return distribution for each investment). Panel C shows the distribution of the 10-year (non-annualized) return if the asset is sold as soon as the investor experiences a -75% return since inception (with no reinvestment of the recovered 25% of the initial outlay).