SPACs *

Minmo Gahng†
Warrington College of Business, University of Florida

Jay R. Ritter‡
Warrington College of Business, University of Florida

Donghang Zhang§
Darla Moore School of Business, University of South Carolina

December 14, 2021

Abstract

Special Purpose Acquisition Company (SPAC) IPO investors have earned annualized returns of 15.9%, while investors for the merged companies have earned -8.1% in the first year on common shares but 68.0% on warrants. We rationalize why certain companies go public via a SPAC merger despite their high costs. We identify the economic roles of SPAC sponsors and investors, and analyze the agency problems that certain SPAC features address. To complete mergers, sponsors frequently forfeit a significant part of their shares and warrants, often transferring them to investors as inducements. SPACs are evolving towards a more sustainable equilibrium.

Keywords: Special Purpose Acquisition Company, SPAC, IPO
JEL Classification: G30, G34, G24

*We thank Nicholas Skibo from Gritstone Asset Management and professionals from SPAC Research for sharing their proprietary data and providing insights throughout this project. We also thank Malcolm Baker, John Coates, Harry DeAngelo, Mark Flannery, Tim Jenkinson, Michael Klausner, S.P. Kothari, Stefan Lewellen, Michelle Lowry, Andy Naranjo, Michael Ohlrogge, Jung Chul Park, and seminar participants at several investment banks, several CFA Societies, the 2nd Boca Corporate Finance and Governance Conference, Concordia University, the 2021 FMA Conference, the 2021 FSU SunTrust Beach Conference, Hong Kong Baptist University, the 2021 NBER Summer Institute, the 2021 KIF-KAEA-KAFA Joint Conference, the University of Connecticut SPAC Conference, the University of Florida, the University of North Carolina Institute for Private Capital, the University of Virginia Mayo Center, and the Workshop on Entrepreneurial Finance and Innovation (WEFI) for helpful comments. Siwen Zhang, Allison Hart, Leli Rostami, Anne-Claire Quindoza, and John Ferkany provided excellent research assistance. We thank Jessica Bai, Angela Ma, and Miles Zheng for sharing their founding dates with us. An earlier version of this paper was entitled "Investor Returns on the Life Cycle of SPACs"

†University of Florida, Warrington College of Business; Ph.D. Student in Finance; Tel: (352) 392-8913, Email: **minmo.gahng@warrington.ufl.edu**.

‡**Corresponding Author**: University of Florida, Warrington College of Business; Cordell Eminent Scholar and Professor of Finance; Tel: (352) 846-2837, Email: **jay.ritter@warrington.ufl.edu**.

§University of South Carolina, Darla Moore School of Business; Professor of Finance; Tel: (803) 777-0242, Email: **zhang@moore.sc.edu**.

1. Introduction

In 2020, the U.S. initial public offering (IPO) market boomed, with 165 operating companies going public, raising $61.9 billion.[1] IPOs by Special Purpose Acquisition Companies (SPACs) set records. A total of 248 SPAC IPOs raised $75.3 billion, more capital raised than in all previous years combined.

A SPAC, a blank check company created by a sponsor, goes public to raise capital and then find a non-listed operating company to merge with, in the process taking the company public. For almost all SPACs created from 2010 until now, units priced at $10 each are issued in the IPO. A typical unit is composed of a common share and one or more derivative securities, usually a fraction of a warrant (a call option issued by the company) entitling the holder to buy a share at an exercise price of $11.50 with a maturity date that is five years after the completion of a merger. Importantly, the money raised in the IPO is placed in an escrow (trust) account where it earns interest. The units later become unbundled, allowing the shares and warrants to trade separately.

SPACs usually pay 5.5% of the proceeds as underwriting commissions, with 2% paid at the time of the IPO and the rest deferred – payable only upon the completion of a merger (business combination). Sponsors are typically compensated by retaining 20% of the SPAC shares, but these sponsor shares (known as the "promote") have no access to the trust account.[2] Sponsors also usually purchase private placement warrants or units at the time of the IPO for approximately their fair market value, with the millions of dollars paid for the securities going to cover the up-front underwriting fees and future expenses as the SPAC searches for an operating company to merge with. This purchase allows the public investors to start with $10 per share in the trust account, rather than the $9.80 in net proceeds from the IPO. All of the sponsors' compensation (payoffs on their shares and warrants) and more than half of the underwriters' fees are thus contingent upon the consummation of a business combination.

[1] The operating company IPO sample includes IPOs with an offer price of at least $5.00, excluding ADRs, unit offers, closed-end funds, REITs, natural resource limited partnerships, small best efforts offers, banks and S&Ls, and stocks not listed on CRSP (NYSE and NASDAQ). See Ritter (2020) (https://site.warrington.ufl.edu/ritter/files/IPO-Statistics.pdf). Both SPAC and operating company IPO proceeds exclude overallotment options.

[2] Typically, the units purchased by investors include Class A shares that can vote on a merger and are redeemable. The sponsors purchase Class B shares that do not have voting privileges and are not redeemable but will convert into Class A shares, which will be subject to lockup restrictions, when a merger is completed. The sponsors typically pay a total of $25,000 for 5,000,000 or more Class B shares, a price of about 0.5 cents per share.

SPACs are not allowed to have pre-identified target companies and usually set 18 to 24 months as a deadline to complete a merger. If a SPAC cannot consummate a merger within this timeline, it must liquidate, distributing the IPO proceeds and the accrued interest in the trust account to its investors. Once a SPAC identifies a target company and reaches an agreement for a merger, public shareholders of the SPAC vote whether to approve the proposed business combination or not. Separately, at this time, each public shareholder decides whether to redeem their shares or not.[3] The redemption option means that there is a money-back guaranty for SPAC IPO investors. Unit holders are allowed to keep (or sell) their warrants even when they redeem their shares.

Because some shareholders may choose to redeem their shares, the amount of cash available for a merger is uncertain. To mitigate this uncertainty, in the merger agreement, operating companies negotiate a minimum amount of cash that the SPAC must deliver. Sponsors frequently invite PIPE (Private Investment in Public Equity) investments as a part of the business combination, providing additional cash. Sponsors themselves sometimes participate as PIPE investors.[4] These PIPE investments either offset redemptions or augment the cash that is delivered in the merger. Securing prominent PIPE investors has a certification effect, encouraging SPAC investors not to redeem. If the merger is approved by shareholders and the SPAC still has enough cash after redemptions to meet the terms of the merger agreement negotiated with an operating company, the business combination is consummated, and the SPAC starts to trade as a newly merged company under a new ticker symbol. In the Appendix, we provide three examples of SPACs with their outcomes.

The recent rise of the SPAC market has resulted in a heated debate about SPACs among both practitioners and academics. Proponents of SPACs argue that, by giving an additional option for raising capital and listing for private companies, SPACs benefit both investors and issuers. Critics, citing poor post-merger returns, raise an incentive misalignment issue between SPAC sponsors and investors created by the fact that a sponsor receives no payoff if a merger is not completed. Furthermore, the 20% sponsor promote and 5.5% underwriting commission results in

[3]The sponsor can ask public shareholders to vote on an extension of the deadline to complete a merger, but must offer the right to redeem if the extension is granted. The sponsor also often makes a contribution, usually a few cents per share, to cover additional costs or to serve as an inducement for investors not to redeem their shares.

[4]The sponsors and their affiliates sometimes commit at the time of the IPO to purchase shares at $10 each when the merger happens in what is known as a Forward Purchase Agreement (FPA).

a high expense level per dollar of cash delivered, especially if many shareholders redeem their shares. Nonetheless, as shown in Figure 1, SPAC IPOs boomed in recent years, and the first three quarters of 2021 saw 447 SPAC IPOs in the U.S., a record pace..

— Place Figure 1 About Here —

Ir our empirical analysis, we first document investor returns on SPACs by dividing the lifecycle of SPACs into two periods – the SPAC period, which is between the SPAC IPO and the completion of the business combination or liquidation; and the deSPAC period, which starts on the first trading day as a merged company. To measure investor returns in the SPAC period, the first half of the life cycle of SPACs, we implement an 'optimal redemption strategy'. This strategy calculates an annualized return for an investor who purchases a SPAC unit, which generally consists of a common share and warrants and/or rights, at the offer price. The investor sells each component of the SPAC unit if the market prices are higher than the redemption values, or redeems if the market prices are below the redemption values, five trading days prior to the close of a business combination or liquidation, mimicking a real-world strategy in which settlement delays must be taken into account.

For the 210 SPAC IPOs from January 2010 – December 2019, investors have on average earned an annualized return of 15.9% during the SPAC period. We find that larger SPACs provide slightly higher returns, as the average IPO proceeds-weighted annualized return of 19.0% is higher than the equally weighted annualized return of 15.9%. Although SPAC period investors earn most of their returns when SPACs consummate business combinations (17.7% per year, equally weighted), even liquidated SPACs provide positive returns (2% per year, equally weighted).[5] This difference in average returns is because SPACs are structured to provide upside potential for the SPAC period investors by offering an option to become a shareholder of a newly traded company, with a money-back guarantee that, since 2010, is typically *gross of* fees. Accordingly, from 2010, even the worst-performing SPAC provided a positive return of 0.51% per year. Given this downside protected nature of the SPAC period investment, a SPAC IPO is equivalent to a *default-free* convertible bond with extra warrants, making 15.9% an attractive average annual return.

[5]Using 47 completed mergers between January 2019 and June 2020, Klausner, Ohlrogge, and Ruan (2021) report annualized SPAC period returns of 11.6%.

These SPAC period returns suggest that a typical SPAC unit has been providing securities that are worth substantially more than the $10 offer price. For many years, the market did not pay attention to this 'free lunch'. We show that in early 2021 the market became more efficient, in that it started to realize the lucrative returns of the SPAC period investment on the first day of trading rather than gradually over many months. The jumps at the opening of trading left less profit opportunity for investors who buy in the secondary market, the same pattern that we observe in the traditional operating company IPO market. The SPAC market has continued to evolve, with sponsors offering less attractive warrant terms when possible, so that a free lunch is no longer being offered.

For the second half of the life cycle of SPACs, the deSPAC period for SPACs that consummated business combinations, we implement a simple buy and hold strategy in which an investor purchases a merged company share on the first day of trading as a deSPAC (merged) company and holds it for one or three years (or until September 30, 2021 for recent mergers). We find that the equally weighted (EW) average one-year buy-and-hold return of the merged companies' common shares is -8.1%, while the value-weighted (VW) CRSP return is 16.5% for the matched period, resulting in an average one-year market-adjusted return of -24.6%. A SPAC typically delivers less money per share than the $10 IPO price to the merging company even after new investments from PIPE investors due to high redemptions, underwriting fees, and the net promote. For the 153 business combinations completed by the end of March 2021 from SPACs that went public in 2015 or later, the mean and median cash delivered per share are only $7.48 and $8.13, respectively. Furthermore, if the merged company is successful, the outstanding warrants are a drag on the upside returns to shareholders. Thus, it may not be surprising that the average deSPAC period market-adjusted return is substantially below zero.

We calculate the return on warrants as well and, surprisingly, find that the EW average one-year buy-and-hold return of the merged companies' warrants is 68.0%. We find that warrant investors have persistently outperformed common share investors. The warrants, out-of-the-money call options in many cases, are riskier and benefit from volatility, but this large difference in average returns between the shares and warrants is puzzling.

We then focus on the dilutive nature of warrants and rights, and document that deSPAC period common shares perform worse when there are more warrants and rights outstanding. The direction of causality is an open question because it is unclear whether investors might have overlooked the dilution cost or lower quality SPACs tend to offer more warrants and rights. Furthermore, using SPAC shareholders' redemption decisions as a proxy for the quality of the proposed merger (Jenkinson and Sousa (2011)) and the timing of a business combination as a proxy for the SPAC sponsors' time pressure (Dimitrova (2017) and Degeorge, Martin, and Phalippou (2016)), we find that higher redemption ratios and the late timing of the deals (i.e., toward the deadline) are associated with both lower SPAC and deSPAC period returns.

This paper contributes to the literature by providing a better understanding of SPACs in five ways, focusing on the economics of three key players: investors, operating (merging) companies, and sponsors.

First, we document investor returns in the SPAC and deSPAC periods and interpret them based on the economic structure of SPACs. While previous studies examining SPACs that went public before 2010 (Jenkinson and Sousa (2011) and Dimitrova (2017), among others) and studies by Renaissance Capital (2020) and Klausner, Ohlrogge, and Ruan (2021) using more recent deals document poor deSPAC period common share returns, this is the first paper documenting the stark differences in investor returns between common shares and warrants. We also find that while the equally weighted post-merger one-year common share return is -8.1%, the public cash-weighted return is 4.5%.[6] The higher public cash-weighted return is due to the pattern that shareholders redeem most of their shares for mergers that subsequently produce the lowest returns, and thus have relatively little money invested in the worst-performing deals. Consequently, focusing exclusively on the EW common share returns paints a worse picture of the deSPAC period investments than what a dollar-weighted portfolio produces.

Second, from a private operating company's point of view, we find that merging with a SPAC is a much more expensive way of going public than a traditional IPO. The total cost of the median company going public via a SPAC merger between January 2015 and March 2021 was 14.6% of

[6]Public cash refers to the money that public SPAC investors leave in after redemptions, and does not include the returns on shares owned by sponsors or PIPE investors. We also call this return a dollar-weighted return.

the post-issue market cap, while it was 3.2% for traditional IPOs. However, we still find that many private companies choose to go public via a SPAC merger. We rationalize this choice by outlining the relative advantages of going public via merging with a SPAC rather than a traditional IPO. These advantages are based on the structure of the SPAC, as well as the economic roles of SPAC sponsors and SPAC IPO investors. For example, having raised capital in an IPO, a SPAC can potentially negotiate a merger with an operating company in a timely manner. Moreover, in the U.S., it has been widely believed until recently that merger law applies rather than securities issuance law for the business combinations, providing a "safe harbor" provision for forecasts of future revenue and profits that security issuance law lacks. It has been argued that SPAC mergers are partly motivated by this regulatory arbitrage opportunity for private operating companies.

Third, we analyze the economic rationale for certain features of SPACs, such as the redemption option and merger deadlines. We posit that the merger deadline exists to reduce the illiquidity cost facing SPAC IPO investors. This deadline, however, creates an agency problem that encourages a sponsor to pursue an unpromising acquisition, because if the SPAC is liquidated, the sponsor shares and warrants become worthless. The redemption option is designed to address this agency problem - by redeeming, public shareholders do not suffer losses on their shares, and they may force the SPAC to liquidate.

Fourth, we document that sponsors give up a sizable chunk of their pre-determined compensation, making their profits not as lucrative as critics suggest, especially for weak deals. On average, sponsors forfeit 17% of their common share promotes and 19% of their private placement warrants, and transfer some of them to other investors as inducements either not to redeem or to invest new capital. We document, as do Klausner et al. (2021), that underwriters sometimes also take haircuts; they surrender 4% of their deferred commissions on average. Importantly, this is the first paper to show that these haircuts have covariance properties that are attractive for other participants: sponsors take larger haircuts and underwriters forfeit commissions more when the proposed merger is not welcomed by the market, as evidenced by high redemption ratios.

Finally, we document how the SPAC market is evolving. As the market has caught on to the attractive SPAC period returns, sponsors have been finding that they do not have to be as generous

in order to generate sufficient demand to fully subscribe an IPO. We show that the market has been adjusting toward a more sustainable equilibrium by making the structure of the SPAC unit less attractive to the SPAC IPO investors, but more attractive to post-merger shareholders. Specifically, we document a downward trend in the fraction of a share that the warrant component of a unit offers. If the merged company prospers and the warrants are exercised, fewer new shares will be issued, and thus there will be less dilution of the merged company's shareholders. We also show that there has been an increase over time in the frequency with which some sponsor shares are subject to vesting requirements. On average, sponsors put 11% of their promote common shares in escrow. These shares, unless certain price targets are met, are either locked up for a long period of time or forfeited. These changes will improve the deSPAC period returns by limiting the returns in the SPAC period and reducing the sponsor payoffs on poorly performing mergers.[7]

2. SPACs and the Market for IPOs

This section addresses SPACs from the point of view of an operating company considering going public and discusses the economics of the SPAC structure. We start by comparing the costs of three different going public methods: 1) merging with a SPAC, 2) a traditional IPO, and 3) a direct listing. We discuss the economic roles of sponsors and SPAC IPO investors. Finally, we outline the relative advantages of going public via merging with a SPAC compared to a traditional IPO.

2.1. The Relative Costs of Going Public

Panel A of Table 1 summarizes the costs associated with three different going public options. The costs associated with traditional IPOs are two-fold: the direct costs of underwriter commissions and indirect costs from the underpricing (i.e., the money left on the table). In addition to the direct costs of underwriter commissions and the indirect costs of underpricing, merging with a SPAC also incurs indirect costs from dilution. The dilution costs are primarily from

[7]Beginning in September 2021, more than 50% of SPAC IPOs began to overfund the initial trust account with the sponsor contributing 30 or 40 cents per share, rather than 20 cents. This change increases the attractiveness of redeeming, and thus may discourage sponsors from proposing less attractive mergers. At the same time, the increased sponsor cash contribution increases the sponsor at-risk capital.

two sources: promote shares held by sponsors, and warrants and/or rights held by public SPAC shareholders and sponsors. For direct listings, the main costs are financial advisory fees that operating companies pay investment banks. We do not consider miscellaneous costs such as SEC registration, audit, and legal fees for all three cases.

For the costs associated with merging with a SPAC, we use SPAC IPOs since January 2015 that completed a merger by March 2021. There were 153 such mergers, but we exclude three mergers that had negative cash delivered because of redemption ratios of close to 100%. We compute the equivalent costs for 677 traditional operating company IPOs between January 2015 and March 2021, after excluding units, ADRs, etc. We also exclude IPOs raising more than $500 million (Uber Technologies, Lyft, Airbnb, etc.) before overallotment options, because they were much bigger than almost all companies involved with a SPAC merger. We also examine the seven companies that went public via a direct listing for the same period.

— Place Table 1 About Here —

Inspection of Panel A of Table 1 shows that merging with a SPAC is substantially more expensive than pursuing a traditional IPO, both in terms of the total cost as a fraction of the cash raised and as a fraction of the post-issuance market capitalization.[8] Merging with a SPAC is even more expensive in comparison with direct listings.

It is important to note a possible selection issue when we compare these relative costs in Panel A of Table 1. Companies choosing SPACs might be fundamentally different from companies

[8]Our median costs as a percentage of cash raised of 48.3% and median costs as a percentage of the market cap of 14.6% are close to the Klausner et al. (2021) medians of 62% and 14%, respectively. Our calculations assume that private placement warrants have the same value as public warrants (adjusting for the fact that private placement warrants normally give the right to buy one share), even though private placement (founder) warrants typically do not have an early redemption provision, making them more valuable than public warrants. Offsetting this bias is that some founder shares have vesting provisions, which would lower their value relative to public shares. Klausner et al. (2021) subtract the value of all warrants from their cash delivered calculations while we do not. This difference partly explains why there exists a greater difference for the costs of going public when cash delivered is used as the denominator instead of market capitalization. Also, Klausner et al. (2021) value the common share at $10 per share whereas we use the market price. For the completed mergers that we use in Tables 1 and 11, the mean and median "underpricing" of the common shares are 15.6% and 3.8%, respectively. We measure the underpricing of the SPAC stocks as the return from $10 to the market price at the date when the merger is closed. SPACs typically use $10 as the anchor price for PIPE investments. However, the 15.6% underpricing is not comparable to that of a traditional IPO, because sponsors acquire their promote shares for about 0.5 cent each, not $10 each. Thus, the cash per share is lower than $10 minus underwriting fees. When we calculate the costs for merging with a SPAC as reported in Panel A of Table 1, we use the market value of all claims, including shares, warrants, and rights, and compare it to the cash delivered to the operating company.

opting for traditional IPOs, having unobservable characteristics. In other words, it is possible that companies that went public via merging with a SPAC would have experienced severe underpricing or a withdrawn deal if they had chosen traditional IPOs. Even with this caveat, however, we do not believe that selection bias can fully explain the large difference in costs between the two methods. Note that the 25th percentile of costs as a percentage of post-issue market capitalization for SPACs is 8.3%, higher than the 75th percentile for traditional IPOs of 7.1%. Panel A of Table 1 reports that more than 10% of traditional IPOs have negative costs of going public. Negative costs occur when there is a sufficiently negative amount of money left on the table due to a price drop on the first day of trading that exceeds the gross spread in magnitude.

Then why do certain companies select merging with a SPAC instead of a less expensive traditional IPO? Are there any benefits that outweigh the extra costs associated with merging with a SPAC? To answer this question, we first discuss the economic roles of SPAC sponsors and SPAC IPO investors. Then we outline the advantages of merging with a SPAC over a traditional IPO.

2.2. The Economic Role of Sponsors and SPAC Investors

We view SPAC sponsors as equivalent to specialized private equity (PE) general partners (GPs) with deep pockets working as ad-hoc underwriters (see Lewellen (2009) and Dimitrova (2017), among others, for the analogy of SPACs as private equity funds). Stulz (2020) points out that the growing importance of intangible assets for young companies makes it costlier for them to be public when specialized private investors can provide mentoring as well as capital. SPAC sponsors can fill this gap, as the individuals behind many SPAC sponsors are industry veterans. Entrepreneurs who decide to go public via a SPAC merger often mention the benefit from sponsors' industry expertise, referring to them as business partners. Specialized sponsors can evaluate merging companies more efficiently and reach an agreement faster, which is another advantage that practitioners often mention.

Deep pockets allow sponsors to invest their own capital, differentiating them from regular underwriters in two ways. First, when sponsors, many of which have expertise in certain industries regarding the merging company, invest their own capital, it serves as a certification

to attract PIPE investors or induce SPAC investors not to redeem their shares. Often, sponsors and their affiliates commit at the time of the IPO to purchase shares at $10 each when the merger happens in what is known as a Forward Purchase Agreement (FPA).

Second, having deep pockets is also important for weak deals because merger agreements almost always require a minimum amount of cash to be delivered as a closing condition. When most SPAC investors redeem and it is hard to find PIPE investors, deep-pocketed sponsors can invest their own money to save the deals. In this scenario, when facing a deadline, the only way to prevent their founder shares and warrants from becoming worthless is to either invest or give up some of the sponsor shares and warrants in order to consummate the merger. Therefore, sponsors are often willing to invest in merging companies at $10 per share, even when they are of the opinion that the correct value is, say, $6 per share. Their weighted average cost, including sponsor shares purchased for less than a penny per share, may still be less than $6, and the warrants are another source of possible value. This may be one reason why grossly underperforming mergers happen frequently: in untabulated results, 29% of SPAC mergers end up having common share returns lower than -90% in the first three years after the mergers, while only 9% of traditional IPOs performed worse than -90% in the first three years after the IPOs.

SPAC sponsors are similar to private equity GPs in several ways. Both SPACs and private equity contracts between general partners (GPs) and limited partners (LPs) typically have deadlines for investing the money provided by investors. These deadlines are designed to prevent a sponsor or GP from making the investment illiquid for a long period of time, but at the cost of creating incentives for investing in negative NPV endeavors as the deadline approaches. In a world of incomplete contracting, the contractual features that we observe frequently involve tradeoffs. We find that a business combination completed under time pressure (i.e., toward the end of the SPAC life cycle) tends to underperform, the same pattern that Degeorge et al. (2016) document for private equity.

The compensation structure of sponsors and GPs is similar as well, as noted by Rodrigues and Stegemoller (2013). Private equity (venture capital and buyouts) GPs are frequently compensated with a 2% per year management fee and carried interest. Metrick and Yasuda (2010) and Phalippou, Rauch, and Umber (2018) show that the sum of management fees over the life cycle

of PE funds has a present value of about 20% of the capital committed, making it equivalent to the sponsor's 20% promote share. The private placement warrants that sponsors purchase at the time of the IPO are similar to the carried interest received by general partners in a typical private equity contract because both provide payoffs only when other investors earn positive returns. Both SPAC sponsors and private equity GPs nurture the operating companies by joining their boards. Considering these similarities, we believe that the compensation of the sponsors is not particularly outrageous when we compare it to the compensation that GPs get in private equity.

However, the analogy is not perfect. While SPAC sponsors will be searching for target companies for up to two years, private equity GPs search for and then monitor their portfolio companies for many more years. On the other hand, the sponsors are putting in their own money ($5 million or more by purchasing private placement warrants or units and much more if they take part in the deal as a PIPE investor), whereas if GPs invest, they are investing in the same convertible preferred shares that the LPs are investing in.[9] Even with this incentive-inducing contract, however, we still find grossly underperforming SPAC mergers on average. We conjecture that the reputational concern (i.e., the inability to conduct future deals if there is a poor track record) is relatively less important compared to private equity because SPAC IPO investors are downside protected by redemption rights while private equity investors do not have the redemption rights.

Regarding SPAC IPO investors, we posit that the redemption right is a critical component of the structure of a SPAC, offering an economic role for SPAC IPO investors in addition to being suppliers of capital. SPACs are faced with three possible outcomes: a good merger, a bad merger, or no merger (i.e., liquidations). As the deadline approaches, a sponsor that is unable to come up with a good merger has an incentive to propose a bad merger. Crucially, however, the redemption option discourages sponsors from doing so. If the shareholders redeem almost all of their shares, the merger will fail because the SPAC does not have enough cash to fulfill the merger agreement requirements, unless the sponsor invests its own money or takes a haircut to induce other parties to provide cash.

[9]The warrants and shares purchased by the sponsor in the private placement during a SPAC IPO will become worthless if a business combination does not happen. As such, the sponsor investment in a SPAC IPO is often referred to as at-risk capital. For the 153 mergers that we use in Table 1, the average at-risk capital is $7.50 million, or 3.5% of the SPAC IPO proceeds.

Around 2010, two changes in the structure of SPAC IPOs occurred: one undermining the disciplinary role of the redemption right and the other strengthening it. First, the voting and redemption rights of public common shareholders, which had previously been bundled together, became separate decisions. One reason for this change, as posited by Rodrigues and Stegemoller (2013), is that when these decisions are bundled together, a hedge fund with a large position can hold up the sponsor if the vote to approve a merger is close, demanding a side payment. Since 2010, SPACs have permitted shareholders to vote in favor of a merger and simultaneously redeem their shares, whereas previously voting in favor of a merger prevented shareholders from redeeming. If there is a liquidation, both sponsor private placement warrants and public investor warrants will be worthless. Thus, public shareholders now have an incentive to approve a bad merger and redeem their shares, whereas previously, they had an incentive to vote down a bad merger so that they could redeem their shares.

The second change, however, made the redemption right more effective as a disciplinary tool. Around 2010, sponsors started to "top up" the initial trust value per share by buying more private placement warrants or units at the time of the IPO and putting the money into the trust, paying the up-front underwriting fees. This purchase results in the sponsor having more "skin in the game". Furthermore, the higher value of the trust makes redemption slightly more attractive for the public investors, increasing the incentive of the sponsor to propose a good merger. Being able to keep or sell the SPAC warrants in spite of redeeming the shares also increases the incentive to redeem.

2.3. The Relative Advantages of Going Public via Merging with a SPAC

In this section, we outline five advantages of merging with a SPAC over a traditional IPO based on the structure of SPACs, and discuss their validity and limitations.

First, based on our interpretation of SPAC sponsors as specialized GPs and ad-hoc underwriters, sponsors can provide advice and certification. This is similar to venture capital (VC) financing: VC funds not only bring capital to companies but also provide mentorship. Hsu (2004) documents that startup companies take offers with 10-14% pre-money valuation discounts

made by VCs with a high reputation because many startup companies consider 'extra-financial' considerations to be important. Similarly, based on anecdotal evidence, entrepreneurs who decided to go public via merging with a SPAC often mention the business insight that sponsors can bring into their companies, mentioning that the cost was a secondary consideration.

However, we cannot observe counterfactuals (i.e., how much it would cost if a company chose an alternative option to go public) to directly compare relative costs, as Hsu (2004) does. Moreover, it is still questionable whether these 'extra-financial' values are worth the significant dilution costs associated with merging with a SPAC. That is, instead of going public via merging with a SPAC, going public via a traditional IPO or a direct listing and appointing industry veterans as board members would seem to be less costly.

Second, it is frequently stated that the time it takes for an operating company to negotiate a merger with a SPAC and win shareholder approval is less than that of a traditional bookbuilt IPO. Starting in mid-2020, a series of companies in the electric and autonomous vehicle industries went public by merging with SPACs. We conjecture that one of the reasons that these companies chose SPACs over traditional IPOs was to swiftly take advantage of the public equity market's favorable sentiment, evidenced by the 743% increase in the stock price of Tesla in 2020. From an operating company's point of view, the timeline of a SPAC merger is between the initiation of a merger negotiation and its consummation. Deep-pocketed specialized sponsors can make the negotiation faster and convince SPAC and PIPE investors who are not experts in the specific industry of the merits of the acquisition by committing their own capital, making the SPAC merger process speedier.

It is challenging, if not impossible, to measure and compare the actual time it takes to go public via merging with a SPAC and a traditional IPO. How long a traditional IPO takes varies, depending on the circumstances and how much advanced work the company has done in terms of preparing audited financial statements, etc. Companies going public with a traditional IPO or direct listing are required to have audited financial statements, but a private operating company merging with a SPAC does not have to satisfy this requirement. In general, the time between the filing of a confidential Draft Registration Statement (DRS) and the public form S-1 (or F-1 for foreign companies) is about three months. After the S-1 is filed, it takes a minimum of

three weeks before the IPO is consummated and the stock starts to trade. Chaplinsky, Hanley, and Moon (2017)'s Table 2 reports a median of 104 days in registration (DRS to IPO date) for their sample of 312 Emerging Growth Company IPOs from April 2012 to April 2015. The time it takes to draft a DRS might be a minimum of a month or so, suggesting a median of at least five months for the time it takes to do a conventional IPO.

What complicates the calculation of "how long does it take to do an IPO?" is that it is rare for a company to suddenly decide to do it as quickly as possible. Instead, most companies thinking of going public start to take actions long before the formal IPO decision, such as hiring a CFO with knowledge of public company reporting requirements and hiring an auditor, which will facilitate the process once a decision is made. How long it takes to write the DRS also varies. Some firms, such as some biotech firms with no revenue, have uncomplicated structures for which most of the registration statements can be "cut and paste" from other registration statements. Other companies may have more complexity in related party transactions, corporate governance, and compensation issues.

Panel B of Table 1 shows that, on average, it takes 154 calendar days for business combinations from the announcement to completion. A typical SPAC announces a business combination when it reaches a definitive agreement with a target company. Before the merger is completed, the SPAC must prepare and file SEC form S-4 (F-4 if the merger is with a foreign company), which must be reviewed by the SEC staff. The S-4 contains much of the information that would be in an S-1, although revenue and earnings projections are generally included, with these projections possibly protected by a "safe harbor" provision that we discuss as a third potential advantage of merging with a SPAC.

Based on these data points, we estimate that it typically takes approximately five months from announcement to the closing of a SPAC merger. The time it takes from the start of a merger negotiation and a definitive agreement is unknown to the public. However, suppose it takes a minimum of a month to negotiate a deal, including negotiations with both the operating company and potential PIPE investors. In that case, it typically takes at least six months for an operating company to consummate a merger with a SPAC. Consequently, merging with a SPAC might have close to no speed advantage for a company that was well-prepared for an

IPO filing, but would be faster for a company that needed time to prepare a DRS that involved complications due to a lack of audited financial statements.

Third, in the U.S., companies going public rarely make forecasts of revenue or earnings, but these are common with merger announcements for which shareholder approval is needed, whether it is a merger between two operating companies or a merger between a SPAC and an operating company. These projections are largely shielded from lawsuits with a 'safe harbor' provision in U.S. laws for mergers (Cazier, Merkley, and Treu (2020), among others), but not for initial public offerings: with mergers, plaintiffs have the burden of proof to show that managers knowingly made false statements, rather than merely having had bad luck, if the company fails to meet the projections. Thus, certain companies wanting to make forward-looking statements to maximize their pre-money valuations can potentially benefit from merging with SPACs, essentially engaging in regulatory arbitrage.[10] A recent statement by SEC staff, however, questioned whether this regulatory arbitrage was consistent with existing law.[11]

Fourth, merging with a SPAC may provide relative certainty compared to a traditional IPO. With a traditional bookbuilt IPO, the offer price and proceeds are negotiated after conducting a roadshow and observing indications of interest from potential investors, making the terms uncertain until the very last day. Moreover, there is uncertainty about how many overallotment shares will be exercised. SPAC merger terms, which involve agreeing on a pre-money value of the operating company, are negotiated before additional information about the market's opinion is known. However, because there is still uncertainty about the redemption rate, operating companies negotiate the minimum cash that must be delivered as a closing condition. In the worst case scenario when sponsors cannot deliver the minimum cash, we observe that companies can still waive this condition and go public without raising much capital.

When there is valuation uncertainty, the merger announcement may be greeted positively or negatively by the market. If there is a positive announcement return that is not reversed by the

[10] See Klausner et al. (2021) for a more detailed discussion of this regulatory perspective.

[11] See the April 8, 2021 statement from SEC Acting Director of the Division of Corporate Finance John Coates at https://www.sec.gov/news/public-statement/spacs-ipos-liability-risk-under-securities-laws in which he points out that the SEC does not define what constitutes an initial public offering. Since SPAC mergers both raise capital for a private operating company and result in it becoming listed, the merger has many functional aspects of an IPO.

time of the merger, money is left on the table by the operating company.[12] But if there is a negative announcement return, the sponsor (and underwriter) may take a haircut in order to salvage the deal. In contrast, with a traditional IPO, if there is weak demand, the issuing firm would have to cut the price and issue size to preserve the deal. Thus, a SPAC merger potentially offers more attractive covariance properties to the issuing firm's shareholders than a traditional IPO.

Fifth, as with other merger agreements, contingent features, such as earnout provisions, can be negotiated. For example, sponsor shares are usually subject to lockup provisions and sometimes are also subject to vesting provisions. We find that 31% of the business combinations for SPAC IPOs since 2015 that completed a merger as of March 2021 have vesting provisions for sponsor promotes. These provisions often require the sponsors to forfeit the part of their promote shares put in escrow if the stock price does not reach a target, say, $12.50 per share, within a certain window. These contingent features provide more contracting flexibility among different stakeholders for SPACs.

Although it is challenging to directly test the relative costs and benefits that determine a company's choice of doing a traditional IPO rather than merging with a SPAC, in Panel A of Table 2, we compare the characteristics of companies merging with SPACs and companies conducting a traditional IPO. Contrary to the conventional wisdom, companies merging with SPACs tend to be larger, as measured by median sales, and older than companies doing an IPO. The proportion of profitable companies is also slightly higher for SPAC mergers. These patterns are mainly because smaller, younger, and not profitable biotech companies mostly go public via traditional IPOs. If we look at the industry composition, biotech companies account for 37% of traditional IPOs, while they account for only 8% of SPAC mergers. If we look at the countries of operation, the distribution is similar between the two. In the Appendix, Table A2 summarizes returns based on different operational aspects of merging companies.

— Place Table 2 About Here —

We formally test how these observable determinants can predict which companies choose one over the other methods of going public. Specifically, in Panel B of Table 2 we report coefficients on

[12] Kiesel, Klingelhofer, Schiereck, and Vismara (2021) report that the average merger announcement return for a sample of 375 U.S. SPACs between 2012 and June 2021 is 6.4%.

the below Probit model with dummy variables for profitable, tech, and biotech companies, and year fixed-effects, for the companies that went public between January 2013 and December 2020.

$$Merging\ with\ a\ SPAC_i = a * Ln(sales)_i + b * Ln(age)_i + c * Profitable_i + d * Tech_i + e * Biotech_i + e_i \quad (1)$$

Sales, age, and profitability combined predict less than 1% of the choice, demonstrating that observable characteristics have little predictive power. Instead, two industry dummy variables, tech and biotech, and year fixed effects explain about 20% of the variation.

Bai, Ma, and Zheng (2021) develop a model and predict that riskier firms tend to merge with SPACs. Similarly, Gryglewicz, Hartman-Glaser, and Mayer (2021) argue that merging with a SPAC is a preferred mode of funding for companies subject to severe adverse selection. However, Panel A of Table 2 shows that biotechnology companies, including many of the riskiest companies, predominantly go public via traditional IPOs.

As of November 2021, more than 500 SPACs are searching for a merger partner. Future studies with more data points can revisit the question of which companies choose to merge with a SPAC to test whether the patterns have changed over time.

3. Data and Sample Construction

In this paper, we study 905 SPAC IPOs in the United States between January 2010 and September 2021 after excluding SPACs traded in Over-The-Counter (OTC) markets.[13] We focus on SPACs that went public in 2010 or later because the structure of SPACs fundamentally changed in 2010.[14] For the SPACs that went public before 2010, Jenkinson and Sousa (2011), Howe and O'Brien (2012), Cumming, Hass, and Schweizer (2014), Dimitrova (2017), and Vulanovic (2017), among others, provide in-depth analyses, mostly focusing on the deSPAC period common share returns.

[13]We exclude 15 SPAC IPOs from 2010-2011 traded in OTC markets because of possible unobservable differences between SPACs traded in major exchanges and OTC markets. Also, stale prices for these IPOs, especially for warrants and rights, prevent us from calculating SPAC period returns easily.

[14]Section A1 of the Appendix discusses differences between SPACs that went public before 2010 and after 2010.

For the SPAC period returns, we study the 210 exchange-listed SPACs that went public between January 2010 and December 2019. We measure the SPAC period returns as of September 2021. We restrict our sample to the SPACs that went public in December 2019 or before in order to provide enough time to include both SPACs that have completed business combinations and those that have liquidated. A typical SPAC has 24 months to complete a business combination with an option to extend the deadline for up to 3 months. We include SPACs from January 2020 - September 2021, however, when we analyze recent trends in unit structures, etc.

Out of 210 SPACs that went public between January 2010 and December 2019, 185 consummated business combinations as of September 2021. For the deSPAC period returns, we focus on 114 business combinations completed by the end of September 2020 to give at least one year of data for recent mergers, as we calculate the deSPAC period returns until September 30, 2021.[15]

We have three broad data sources. First, the primary data source on SPAC IPOs and traditional operating company IPOs is the Refinitiv (also known as Securities Data Company – SDC Platinum) new issues database, augmented with data from Dealogic.

Second, we use two commercial SPAC databases: Gritstone Asset Management's OmniView (https://www.gritstoneam.com/omniview) and SPAC Research (https://www.spacresearch.com). These databases provide detailed information regarding the structure of each SPAC and its derivative securities, such as the exercise price of warrants and rights, the number of warrants and/or rights that come with each unit, and the fraction of common share that a warrant (right) converts into. The data also include the prices of units, common shares, warrants, and rights; and information about SPAC sponsors, the initial trust amount, the redemption history, the identity of merging companies, and various announcement and actual business combination (or liquidation) dates.

[15]For the mergers used in Table 1 and later in Table 11, we use all business combinations until March 2021 for SPAC IPOs since 2015. These mergers include the ones by SPACs that went public later than September 2020, as we do not need return data, and the bias due to ongoing deals is not a concern. We do not include the mergers from the SPACs that went public before 2015 to make the manual collection of data manageable. The information is mostly from SEC filings. These filings are idiosyncratic and are often inconsistent from one filing to the next for the same merger due to the dynamic nature of merger negotiations.

We validate the accuracy of the data by cross-examining the two commercial databases. If we find any discrepancies or irregularities, we do further investigations using EDGAR, Capital IQ, Pitchbook, Dealogic, Bloomberg, and Refinitiv Eikon to make necessary adjustments. We extend the data by hand collecting further information related to the deSPACing process, such as the estimate of economic benefits (i.e., promotes) that SPAC sponsors and underwriters forfeit (i.e., 'haircuts') and extra inducements that sponsors and merging companies offer for non-redeeming shareholders and/or PIPE investors.

Third, for the deSPAC period common share returns, we use CRSP daily returns until September 2021. To calculate warrant returns for the same period, we collect warrant prices from Bloomberg and Refinitiv. We use Compustat, EDGAR filings, and Capital IQ to record profitability, sales, and founding dates data for merging companies.[16]

Table 3 reports the number of SPAC IPOs between January 2010 and September 2021.[17] We compare them to the traditional operating company IPOs from the same period. Our sample of traditional IPOs includes IPOs with an offer price of at least $5.00, excluding ADRs, unit offers, closed-end funds, REITs, natural resource limited partnerships, small best efforts offers, banks and S&Ls, and stocks not listed on major exchanges. In 2020, for the first time, SPAC IPOs outnumbered traditional IPOs, raising more capital as well. The amount of capital raised by SPAC IPOs in 2020 exceeded the total in all previous years combined.

— Place Table 3 About Here —

4. Returns on the Life Cycle of SPACs

In this section, we examine investor returns by breaking down the SPAC lifecycle into two periods. The first is the SPAC period, starting from the SPAC IPO date to either a business combination completion date or a liquidation date. For the SPACs with completed business combinations, we define the deSPAC period as starting on the day that the SPAC

[16]For founding dates, we exchanged our files with these used in Bai et al. (2021), and then re-investigated the 10% or so of firms for which there were disagreements. This procedure resulted in both sets of authors revisiting approximately 5% of their founding dates to earlier years.

[17]In the Appendix, Table A1 reports the same statistics for SPACs that went public before 2010.

starts to trade as an operating company with a new company name and ticker symbol following the business combination. We document comprehensive investor returns for the two periods and discuss the cross-sectional patterns.

4.1. Returns for the SPAC and deSPAC periods

We first document returns from the SPAC period, which starts on the SPAC IPO date and ends five trading days before either a business combination completion date or a liquidation date. We report returns based on a variation of a buy and hold strategy that we term the "optimal redemption" strategy. This strategy calculates an annualized return for an investor who purchases a SPAC unit, which consists of a common share and a pre-specified number of derivative securities (warrants and/or rights), at the offer price. We assume that the investor sells each component of the SPAC unit at the closing price five trading days before the close of the business combination or liquidation. For common shares, we assume that investors redeem if the redemption value is higher than the market price and sell if the redemption value is lower than the market price.

Our strategy is based on the following observations. First, SPAC IPOs have minimal first-day returns during 2010-2019 – a SPAC with an offer price of $10 with a trust value of $10 per unit typically finishes the first day of trading around $10.00 - $10.05, resulting in little difference between the buy-and-hold returns measured from the offer price and the closing market price on the first day of trading. In the first quarter of 2021, the average first-day return increased to 3.7%, before falling back to 0.3% in the second quarter. Second, dividing the lifecycle of SPACs into SPAC and deSPAC periods makes sense as Klausner et al. (2021) document that more than 92% of SPAC period investors identified in 13-F filings exit before the completion of a business combination. For the investors that do not redeem, they frequently sell their shares in the market before a merger is completed. Third, we calculate returns based on the prices five days prior to the business combination or liquidation dates to make this strategy implementable considering the time it takes to redeem shares due to settlement delays, etc. Fourth, during most of our sample period, SPAC period returns are mostly realized at the time of and after SPACs announce business combinations, with minimum price changes before the announcement. That said, as it is not feasible to predict when SPACs would announce mergers, a realistic strategy

requires investing from the IPO.[18] Finally, based on the authors' conversations with multiple practitioners, we confirm that buying at the IPO and selling or redeeming before a merger is completed represents the actual institutional investors' investment strategy.

Specifically, our strategy calculates the annualized SPAC period return, R_{SPAC}, as

$$P_s / P_i = (1 + R_{SPAC})^{(Months/12)} \tag{2}$$

Where

$P_s = max(Common\_P_{t-5},\ Common\_R_{t-5}) + Price\ Structure\ of\ Warrant \times Warrant\_P_{t-5} + Price\ Structure\ of\ Right \times Right\_P_{t-5}$

$P_i = IPO\ Price\ of\ a\ Unit$

Months refers to the number of months between the SPAC IPO and the business combination or liquidation, *Price structure of warrant (right)* is the fraction of warrant (right) a SPAC unit includes. $Common\_P_{t-5}$ is the common share price, $Common\_R_{t-5}$ is the redemption value for a common share, $Warrant\_P_{t-5}$ is the warrant price, and $Right\_P_{t-5}$ is the price for right, all measured as the closing market price five trading days prior to the business combination or liquidation date. Note that while all common shares come with the redemption right, warrants are occasionally renegotiated to be redeemed at the time of the merger. For warrant and right prices, we calculate prices by adjusting the price structures for each SPAC. For example, if a SPAC unit includes one share of common share and 1/3 of a warrant, we multiply the warrant price by its price structure (1/3) as an investor purchasing a unit from the IPO would receive 1/3 of a warrant. We use the price data instead of total return data because no SPACs pay dividends.

It is noteworthy that there are two ways for a SPAC to structure its unit to provide warrants worth 1/3 of a common share per unit. A majority of SPACs state that each unit includes 1/3 warrant and each warrant gives investors the right to buy a share. Some SPACs,

[18] While some SPACs do not announce business combinations within 24 months, some others announce them as early as within a month from the IPO. Typically, beyond the first week of trading after the IPO, there is relatively little trading volume until a merger is announced. In late 2020 and the first two months of 2021, many SPACs that had not announced a merger traded well above $10 per unit, but the prices dropped in March of 2021. Our returns end in September 2021.

however, design the unit to provide one full warrant which gives investors the right to buy 1/3 of a share. In this case, after a SPAC unit becomes unbundled, warrants convert into warrants that entitle the holder to buy one full share, making them identical to the first case. Our calculations make the appropriate adjustments.

Table 4 reports annualized SPAC period returns based on SPACs that went public between January 2010 and December 2019. Panel A reports annualized SPAC period returns based on the year of the SPAC IPO, equally weighting each observation. On average, SPAC period investors earned 15.9% per year based on our optimal redemption strategy. Panel B documents the important fact that even liquidated SPACs produce positive returns. This is because although a typical SPAC pays 2% of the proceeds as an up-front underwriting fee, sponsors purchase warrants or units and deposit the cash into the trust account, covering the underwriting fee. This is one mechanism that sponsors utilize to attract SPAC IPO investors: offering downside protection in the form of a money-back guarantee *gross of* investment banking fees. Therefore, SPACs have at least 100% of the IPO proceeds in the initial trust account, delivering on average 2.0% annual returns even for the liquidated ones. Out of 210 SPACs that went public between January 2010 and December 2019, 0.51% was the lowest annualized return on any SPAC IPO. Panel C reports that larger SPACs provide slightly higher returns, as the average IPO proceeds-weighted annualized return of 19.0% is higher than the equally weighted annualized return of 15.9%.

To avoid a potential look-ahead bias, we also include 6 SPACs that went public in or prior to 2019 but had not completed a business combination or liquidated as of September 2021. We refer to them as ongoing SPACs and calculate their mark-to-market returns using prices at the end of September 2021. Panel B shows that these 6 ongoing SPACs were trading at a premium, producing higher returns than SPACs that are liquidated.

— Place Table 4 About Here —

Given the downside protection of SPAC IPOs, we interpret the SPAC period investment as equivalent to investing in default-free Treasury Bills, along with an option to convert into the common stock of a company going public. These features make SPAC units equivalent to default-free convertible bonds. Actually, SPAC units are even better than

a default-free convertible bond, in that they typically also contain a warrant to buy a fraction of an additional share. Thus, many hedge funds, some of which are known as the 'SPAC mafia', find the risk-adjusted returns attractive.[19]

Next, we examine the deSPAC period investment returns in Tables 5, 6, and 7. Tables 5 and 7 are based on a simple buy-and-hold strategy in which an investor purchases a merged company stock or warrant at the beginning of the first day of trading for which the SPAC has a new entity name and new stock and warrant ticker symbols. Table 6 reports the Fama-French three-factor model regression results for the deSPAC period stock returns.

We calculate buy-and-hold returns until the earlier of the one-year (three-year) anniversary or the delisting date (or September 30, 2021). When the full one-year or three-year data are not available, we calculate the returns based on available data. For example, if a merged company started to trade in October 2020 and was still listed on September 30, 2021, we report the buy-and-hold returns from October 2020 to September 30, 2021, as both one-year and three-year returns. As a benchmark, we report the market return using the CRSP value-weighted index matched to the investment period of each merged company.

Specifically, the one-year and three-year buy-and-hold returns for deSPAC company i's common share (Table 5) is defined as

$$BHRC_{i,t} = \prod_{t=1}^{min(T,\ delist)} (1 + R_{i,t}) - 1 \tag{3}$$

Where $R_{i,t}$ is the net return in period t on deSPAC company i's common share, compounded daily using the CRSP data. The one-year and three-year buy-and-hold returns for deSPAC company i's warrant (Table 7) is defined as

$$BHRW_{i,t} = \frac{P_i\_min(T,\ delist)}{P_i\_deSPAC\_date} \tag{4}$$

[19] Appendix Table A3 provides the list of the largest holders of SPACs as of September 2021.

where $P_i\_min(T,\ delist)$ is the price of deSPAC company i's warrant at time T (one-year or three-year) or the delisting date, whichever comes first, and $P_i\_deSPAC\_date$ is the closing price of deSPAC company i's warrant on the business completion date. While we use prices for warrants because warrants do not pay dividends, we use total returns for common shares because common shares sometimes pay dividends. Using the CRSP volume and return data, we inspect the first two weeks of trading as a merged company and find ample liquidity and no large average abnormal returns or price changes for the common shares. This validates that our deSPAC period buy-and-hold strategy is implementable.

Table 5 reports the deSPAC period buy-and-hold returns on common shares for 114 business combinations consummated between January 2010 and September 2020. Table 7 reports returns on warrants for the same period. Note that we only analyze 105 of the 114 business combinations for warrant returns. This is because five SPACs did not have warrants from the beginning, and four SPACs redeemed warrants either for common shares or cash during the deSPACing process. We thus exclude these nine companies. Additionally, the warrant price information was not available for six companies. For these cases, we assume that the warrant returns were the same as common share returns. Our qualitative results do not change if we also exclude these six cases.

Another notable feature of the SPAC warrants is that merged companies usually have call rights for the warrants when the stock price hits a certain level, usually $18. Thus, although the warrants typically have a 5-year post-merger maturity date, they may be called early. For example, Virgin Galactic, which went public by merging with Social Capital Hedosophia Holdings Corp on October 25, 2019, announced on March 13, 2020, that it will redeem its warrants on a "cashless basis". Under the Warrant Agreement, one warrant will be exchanged for 0.4927 of a share of common stock, with warrantholders not paying the $11.50 exercise price. When the warrant redemption happens, we calculate the investment returns based on the assumption that investors sell warrants on the last day of the redemption deadline, instead of becoming common shareholders. Because of the caps, the public market warrants are not as valuable as if they were uncapped. It should be noted that the private placement warrants purchased by the sponsor at the time of the IPO typically are uncapped.

— Place Table 5 About Here —

Table 5 shows that common shares have equally weighted average deSPAC period one-year returns of -8.1%, underperforming the market by an average of 24.7%. The low returns are consistent with prior studies covering SPACs that went public before 2010 (Jenkinson and Sousa (2011) and Dimitrova (2017), among others), and contemporary papers studying recent SPACs, including Klausner et al. (2021) and Kiesel et al. (2021), all of which find poor deSPAC period common share returns.

Importantly, Table 5 Panel B demonstrates that different weighting methods yield significantly different outcomes. For example, assume that there are two SPACs, A and B, and SPAC A raised $400 million and SPAC B raised $100 million from their IPOs. Both completed business combinations and the redemption ratio for SPAC A is 10% and SPAC B is 90%. If the one-year deSPAC period common share return is 10% for SPAC A and -30% for SPAC B, the equally weighted return is -10% ($\frac{10\%+-30\%}{2}$). However, the IPO proceeds weighted return is 2% ($10\% \times \frac{400}{400+100}$ + -30%$\times \frac{100}{400+100}$). If we weight based on the SPAC IPO proceeds delivered to the merging companies (public cash), $360 million for SPAC A and $10 million for SPAC B, the average return is 8.92% ($10\% \times \frac{360}{360+10}$ + -30%$\times \frac{10}{360+10}$).

Our optimal redemption strategy from the SPAC period investment implies that the redemption ratio is bimodally distributed: all SPAC shareholders keep (or sell) their shares if the share price is higher than the redemption value and all SPAC shareholders redeem their shares if the share price is lower than the redemption value. Therefore, mergers that generate little investor enthusiasm tend to have high redemption ratios and thus little public cash is delivered to the merging companies. As SPAC investors protect themselves by exercising redemption options, Panel B of Table 5 shows that the average public cash-weighted investor return of 4.5% is not as bad as the equally weighted average of -8.1%. Later, in Table 10, we show that redemption ratios predict deSPAC period common share returns.

We also run Fama and French (1993) three-factor regressions to examine how deSPAC period common share returns load on standard asset pricing factors and to shed further light on the stock performance of merged companies during the deSPAC period. Specifically, we run

$$R_{p,t} - R_{f,t} = a + b * (R_{m,t} - R_{f,t}) + c * SMB_t + d * HML_t + e_{p,t} \quad (5)$$

where $R_{p,t}$ is the return on either the equally weighted or post-issuance market capitalization-weighted return of a portfolio of deSPAC common shares in calendar month t; $R_{m,t}$ is the return on the value-weighted CRSP index in month t; $R_{f,t}$ is the one-month T-bill rate in month t; SMB_t is the return on small firms minus the return on big firms in month t; and HML_t is the return on high book-to-market stocks minus the return on low book-to-market stocks in month t.

— Place Table 6 About Here —

Table 6 shows that, consistent with the raw returns reported in Table 5, deSPAC period common shares underperform by 0.8% to 1.9% per month, although not all of the alphas are reliably different from zero. This is mainly because monthly portfolios early in our sample period of March 2013 to September 2021 include only a few companies, resulting in high standard errors. Both equally weighted and value-weighted portfolios load positively on SMB, which is not surprising given that most merged companies have market caps that place them in the Russell 2000.

— Place Table 7 About Here —

For the deSPACs with traded warrants, Panel A of Table 7 reports the stark difference between investor returns on common shares and warrants for the companies that went public via SPACs – while common shares underperform the market, warrants on average substantially outperform common shares. The equally weighted average one-year warrant return is a remarkable 68.0%. Panel A's 'units' column represents a deSPAC period investment strategy replicating the initial specification of the SPAC IPO unit. For example, assume that a SPAC unit includes a common share and half of a warrant but no rights, and the price of the common share is $10, and the price of the warrant is $1 on the first trading day as a merged company. If one-year buy and hold returns for the common share and warrant are -10% and 20%, respectively, this unit holder return would be -8.57% ($-10\% \times (\frac{\$10}{\$10+\$0.5})$ +

$20\% \times (\frac{\$0.5}{\$10+\$0.5})$). Panel A shows that the average unit holder investment return is higher than the common share investment return by only 2.2% to 3.1%: deSPAC period investors still lose money and substantially underperform the market in most years.

The improvement in deSPAC period unit returns is marginal because the average price of warrants on the first day of trading as a merged company is \$1.60, while it is \$10.50 for the common shares, and most units provide less than one full warrant.[20] Also, Panel B of Table 7 shows that warrants with lower prices at the time of the merger outperform warrants with higher starting prices, as the price-weighted warrant returns are lower than the equally weighted returns. However, given that most of the underperforming common shares are indeed redeemed during the deSPACing process while warrants typically do not have redemption rights, this unit holder investment strategy does not necessarily reflect the actual deSPAC period investment returns earned by the average investor. Instead, the public cash-weighted average return of 4.5% in Table 5 for shares and the warrant price-weighted average of 25.6% in Table 7 for warrants are probably the best measures.

It is important to discuss the possible reasons behind the substantial difference between common share returns and warrant returns. While warrants should yield higher returns because they have greater risk, we argue that this stark (i.e., different signs) and persistent (i.e., Panel A of Table 7 shows that warrants outperformed common shares in all nine vintage years) difference cannot be solely justified by the risk component. It is possible that the market may have undervalued warrants during the merging process. If so, an increase in warrant prices at the time of the merger should improve SPAC period and lower deSPAC period returns in the future.

As we discuss more in-depth in Section 6, sponsors often forfeit part of their promote shares and private placement warrants and transfer some of them to different shareholders, including selected non-redeeming SPAC investors or PIPE investors. Therefore, some SPAC investors who do not redeem their shares receive some compensation to offset price per share declines. Thus, the dollar-weighted returns for SPAC investors may be even more attractive than the Table 5 numbers indicate, and actual sponsors' returns maybe not as lucrative as the initial contract

[20] The median number of warrants in a unit for SPAC IPOs since 2015 that completed a merger before March 2021 is 1/2. For SPAC IPOs in 2020 that completed a merger by March 2021, the median is 1/3.

suggests. For example, assume that a hedge fund is given 0.4 shares for every share that it does not redeem, and the redemption value was $10.20 per share. This inducement makes the hedge fund's per share price equivalent to $7.29 ($10.20/1.4). Therefore, even if the market price of a share falls to $8.00 a year later, the hedge fund's actual return is 9.74% ($8.00/$7.29 – 1), assuming that there is no dividend paid.

Another fact is that, although the recent deSPAC period common shares still underperform the market, the overall returns have been improving over time in general, along with warrant returns and SPAC period returns. Furthermore, we conjecture that this uptrend in returns partly explains the recent SPAC wave, as it is widely believed that investors chase past returns (Hong and Stein (1999), among others).[21]

Finally, even with the overall improvements in the SPAC market, deSPAC deals still include some severely underperforming companies. Specifically, out of 41 deSPAC mergers between 2012 and 2017, 29% (12) of them had three-year buy-and-hold returns lower than -90%, while among 756 traditional IPOs from the same period, only 9% (66) of them produced returns lower than -90%. This is consistent with Jenkinson and Sousa (2011)'s view that the 'extreme incentives' that sponsors face result in acquisitions of low-quality companies that would not be able to go public via a traditional IPO process. We should note that for those deals, however, the SPAC shareholder redemption rates are almost always close to 100%, meaning that the actual losses of SPAC investors are minimal, and these merging companies end up going public with little capital raised.

4.2. Cross-Sectional Patterns in Returns

In this section, we examine cross-sectional variations of both SPAC and deSPAC period returns, focusing on the characteristics of the merging company, the quality of SPAC IPO underwriters, the time between the SPAC IPO and the business combination completion or liquidation, and

[21] Blomkvist and Vulanovic (2020) report that from July 2003 to December 2019, SPAC IPO volume was significantly negatively related to the VIX index, a measure of stock market volatility. SPAC IPO volume skyrocketed during April 2020-March 2021, however, a period during which the VIX index was persistently above the 2003-2019 average, suggesting that their in-sample evidence does not hold out of sample. Consistent with this observation, Table 5 of Bai et al. (2021), using quarterly data from July 2003 to September 2020, report that SPAC IPO volume is insignificantly related to the logged level of the VIX index.

the SPAC shareholder's redemption decisions. For the deSPAC period, we discuss only common share returns, as warrant returns generally show similar patterns, but with larger magnitudes.

As the IPO literature suggests that high-quality issuers and high-quality underwriters match with each other (Carter, Dark, and Singh (1998) and Fernando, Gatchev, and Spindt (2005), among others), we investigate which investment banks underwrite SPAC IPOs. Using underwriter reputation ranks (*UWRANK*) from Loughran and Ritter (2004) based on the 1 (low) to 9 (high) prestige scale introduced by Carter and Manaster (1990), Panel A of Figure 2 reports that the average quality of SPAC IPO's lead left bookrunners has improved over time in general.[22] Panel B of Figure 2 shows that three prestigious underwriters, Goldman Sachs, Morgan Stanley, and JP Morgan, started to underwrite SPAC IPOs in 2016, and their market shares increased substantially in 2020 and 2021. Not shown are other underwriters with large market shares: Citigroup, Credit Suisse, Deutsche Bank, and EarlyBird Capital (a SPAC specialist).

— Place Figure 2 About Here —

Table 8 reports both annualized SPAC period returns and one-year and three-year deSPAC period returns based on the underwriter ranks used in Figure 2. We divide our sample into three groups by assigning 5 and 8.5 as thresholds to make each group include approximately one-third of the sample. Inspection of Table 8 shows that SPACs with more reputable lead left underwriters tend to have both higher SPAC and deSPAC period returns, although SPACs with lead left underwriters ranked between 5 and 8.5 outperform SPACs with lead left underwriters ranked over 8.5 based on three-year returns. This non-monotonicity is because some right tail outliers with very high returns are underwritten by mid-tier underwriters.

— Place Table 8 About Here —

We then focus on how the potential dilution from the warrants impacts various returns. While some SPACs do not include any derivative securities, most of them include at least one type of derivative securities, usually warrants. Most warrants have $11.50 as an exercise price, a 15%

[22]For the complete updated list of underwriters and their ranks, refer to Jay Ritter's website "IPO Underwriter Reputation Rankings (1980 – 2020)" (https://site.warrington.ufl.edu/ritter/ipo-data/).

premium to the IPO price. Based on our sample, the minimum potential dilution per unit is zero, and the maximum is 1.1 – when a unit includes a warrant and a right, and a warrant converts to one common share and a right converts to one-tenth of a common share.[23] Therefore, there is significant variation regarding the potential dilution: when exercised, warrants and rights would become common shares, diluting the ownership of existing shareholders.

Table 9 reports both annualized SPAC returns and one-year and three-year deSPAC returns based on the potential dilution measure – the fraction of a common share that derivative securities included in a unit can convert into. We divide our sample into three groups – top, middle, and bottom terciles based on the magnitude of potential dilution. Table 9 shows that both for the SPAC period and the deSPAC period returns, we find a clear monotonic relation in which SPACs with higher potential dilution substantially underperform.

It should be noted that the cross-sectional patterns documented in Tables 8 and 9 (higher returns for SPACs with higher prestige underwriters and lower dilution in the unit structure) confound cross-sectional and time-series patterns. For example, in 2020 and in early 2021, both SPAC period and deSPAC period returns were higher than before. The prestige of underwriters was higher (Figure 2) and the dilution was lower (Figure 3) towards the end of our sample period.

— Place Table 9 About Here —

We also examine two factors introduced by prior studies associated with deSPAC period common share returns. First, motivated by Jenkinson and Sousa (2011), we focus on the SPAC shareholders' redemption decisions. Specifically, Jenkinson and Sousa (2011) classify deSPAC deals into two categories: 'Good SPACs' when the price for a SPAC common share is higher than the redemption value, which is the trust value per share; and 'Bad SPACs' when the price for a SPAC common share is lower than the redemption value, measured at the time of shareholder voting for the proposed mergers. They find that Bad SPACs significantly underperform Good SPACs during the deSPAC period.

[23] Rights, while less common, typically have a zero exercise price. They are essentially a fraction, usually one-tenth, of a bonus share instead of a bonus warrant topping off the SPAC unit.

We revisit this question using SPAC shareholders' redemption decisions as a proxy for the quality of the proposed merger. That is, based on our optimal redemption strategy for the SPAC period investment, investors would redeem their common shares if the redemption value is higher than the market price. Therefore, a high redemption ratio means that the market price was lower than the redemption value (Bad SPACs).

— Place Table 10 About Here —

In Table 10, specifications (1) and (4) show that a high redemption ratio predicts underperformance of deSPAC period common share returns, echoing Jenkinson and Sousa (2011)'s finding. We find the same directional result for the SPAC period returns, but do not report it because the relationship is somewhat mechanical – the lower the price, the more likely that redeeming is the value-maximizing investor strategy. The coefficient of -0.572 in column (1) implies that a deal with a 5% redemption ratio will have a 50.9% better one-year return than a deal with a 95% redemption ratio, consistent with our Table 5 results with different weighting methods.

We also revisit Dimitrova (2017)'s finding that deSPAC performance is worse for deSPAC deals announced near the two-year deadline by including *Ln(Months)*, the logarithm of the number of months between the SPAC IPO and the business combination completion (or liquidation for SPAC returns). Panel B's specifications (2) and (5) show that the longer it takes to close a business combination, the lower the subsequent deSPAC period returns, although the results are not statistically significant for three-year returns. In other words, deSPAC deals rushed near the deadline underperform, confirming Dimitrova (2017)'s finding from the pre-2010 period and similar conclusions from other markets such as Degeorge et al. (2016)'s finding from private equity secondary buyout transactions.

When we include both the *redemption ratio* and *Ln(Months)* as explanatory variables, the redemption ratio plays a more important role. Other variables also predict deSPAC returns. A recent paper by Lin, Lu, Michaely, and Qin (2021) examines sponsors' connections and networks and finds that SPACs with well connected sponsors have higher chances of completing a merger and produce better deSPAC period returns. Another recent paper by Kiesel, Klingelhofer,

Schiereck, and Vismara (2021) finds that SPACs merging with operating companies that have large assets in comparison to the SPAC's market value have higher deSPAC returns.

5. The Recent Evolution of the SPAC Market

In this section, we discuss the economic reasons behind the recent changes in the SPAC market, and why the market started to boom in 2020. So far, we have argued that investing in SPAC IPOs is equivalent to investing in underpriced default-free convertible bonds with extra warrants, which have generated positive abnormal returns for SPAC period investors. What should the SPAC period returns be? We provide a simple back of the envelope calculation to demonstrate why there has been strong demand for SPAC IPOs in the market, and how sponsors have been responding.

Assume that a five-year warrant to buy one share at an exercise price of $11.50 that can be called early by the issuer once the market price of a share hits $18 (a typical feature) is worth $2.00 after the merger announcement. A unit that is composed of a redeemable share plus a warrant to purchase a full share would, after a merger announcement, be worth the max of [($10 + interest), (the share price after a merger is announced)], plus the value of the warrant. In the current low interest rate environment, $10 + interest might be worth $10.10 at redemption. Assume that the shares, conditional on not being redeemed after the merger agreement is announced, are worth $11.00. Using the average redemption ratio of 37% conditional on a completed merger (see Table 11), the expected value of a share is 0.37×$10.10 + 0.63×$11.00 = $10.67. The units would then have an expected ending value of $10.67 + $2.00 = $12.67. If on average a merger took 2 years to complete, the annualized return from the $10 offer price would be about 12.6% per year. But if the unit included a warrant to buy only 1/4 of a share, the value of the warrant would not be $2.00, but $0.50. Then the units would be worth $10.67 + $0.50 = $11.17, and the annualized return would be just under 5.7%.[24]

[24]If the SPAC IPO contained 20 million units, the warrants, at $2.00 each, which entitle the holder to buy one share per warrant, would be worth $40 million in aggregate. Warrants to buy ¼ of a share would presumably be worth approximately $10 million in aggregate. If, after the merger, there will be 75 million shares owned by legacy operating company shareholders, 20 million public shares, and 5 million sponsor shares, the $30 million reduced value of the warrants should add $0.30 per share to the total of 100 million shares. Our simple back of the envelope calculations do not adjust for the difference in the price per share that would exist if the aggregate value of outstanding warrants was less. We are also ignoring the possibility of a liquidation that would make the warrant worthless.

An annualized return of 5.7% is still higher than the risk free rate, even though the redemption option results in no downside risk for an investor that holds until liquidation or merger completion. The redemption option, however, is generally not available until a merger announcement, exposing an investor to illiquidity and potential fire sale risk.[25] Thus, equilibrium returns should be higher than the risk free rate, but by only a modest amount, suggesting that warrants to buy a large fraction of a share are excessively generous. At the risk of oversimplifying, the default-free convertible bond by itself is worth approximately $10, and warrants are a free lunch for IPO investors.

Investors, especially the SPAC Mafia, have realized that SPACs provide overly generous deal terms. Recently, other investors have also been willing to buy in the market, driving up the first-day returns of the SPAC IPOs. Sponsors have responded by providing fewer warrants per unit. In Figure 3, using data from January 2018 to September 2021, we show the quarterly SPAC IPO average first-day return, and the quarterly average of the potential dilution per unit. This figure illustrates these two important recent changes. First, the market became more efficient, because it has started to realize the SPAC period abnormal returns immediately as first-day returns, rather than after a merger is announced. In the first quarter of 2021, 298 SPAC IPOs occurred, with average first-day returns of 3.7%. Second, with the increased investor demand for SPAC IPOs, sponsors have started to structure SPAC IPOs with fewer warrants and less dilution. This second change reduces the wealth transfer from operating company and deSPAC period shareholders (including the sponsor) to SPAC period investors, making SPACs less attractive for IPO investors, but more attractive for deSPAC and operating company shareholders.

These trends began to reverse in the second quarter of 2021. As hundreds of SPACs went public in 2020 and early 2021, the market started to reevaluate the possibility of successful mergers and readjust expected returns. That is, having hundreds of SPACs with similar deadlines searching for target companies will eventually result in more SPACs being liquidated. Conditional on the SPACs that do consummate mergers, the increased competition will drive up the pre-money valuation that operating companies can demand, lowering the expected returns for the SPAC period investors. Thus, from the second quarter of 2021, the average first-day

[25] In March 2020, during the short-lived Covid-19 panic, many SPAC units dropped to a market price of approximately $9.50.

return dropped, to -0.2% in the third quarter, reflecting investors' expectation adjustments. Accordingly, sponsors reversed their course, and started to offer more generous warrants to attract the SPAC stage investors. Note that the decline in first-day returns does not reflect a decline in market efficiency. Rather, it reflects revised expectations of SPAC IPO period performance due to a supply increase and changed warrant terms.

— Place Figure 3 About Here —

Making SPAC units less attractive by reducing potential dilution per unit will make merging with a SPAC a more attractive alternative to the traditional IPO for operating companies. As we have seen from Table 9, higher potential dilution per unit predicts lower deSPAC period returns. Moreover, having less dilutive warrants should minimize the incentive misalignment issue in which SPAC investors redeem their shares but still approve value destroying mergers because they hold warrants. If SPAC IPO units did not include any derivative securities, investors would have no incentive to approve value destroying mergers, and this would, in turn, incentivize sponsors to select better target companies with more reasonable valuations.

In this regard, one noticeable new trend in the market is that some SPACs have started to offer 'contingent warrants'. For example, Global Partner Acquisition Corp II, which went public on January 11, 2021, provides 1/6 of a warrant to buy a share at $11.50. In addition, at the time of a proposed merger, any shareholders that do not redeem will be given an additional 1/6 of a warrant per share. So, if shareholders redeem, they keep 1/6 of a warrant, and if they don't, they will have 1/3 of a warrant per share. We view this type of SPAC structure, which discourages redemptions, as illustrating another possible mechanism that the market is using to adjust towards a more sustainable equilibrium in which SPAC period IPO investors collect less economic value, allowing deSPAC period investors to capture more.

Another emerging contingent feature is the earnout, or vesting, provision for sponsor promotes. These earnout provisions typically require that the stock price stays above a threshold price in order for the shares to be released to the sponsor.[26] Sponsor shares, as well as private

[26]For example, for the merger between Double Eagle Acquisition Corp. and Williams Scotsman, which was closed on November 29, 2017 and is now called WillScot Mobile Mini Holdings Corp. (Ticker Symbol WSC on

placement warrants, will become worthless if a merger does not happen. The financial press and the academic literature point to the underperformance of SPAC mergers and have highlighted how this powerful incentive structure for SPAC sponsors may incentivize sponsors to go forward with a bad merger. Possibly as a response to such concerns, we have observed an upward trend in the frequency of earnout provisions. For the 153 business combinations for SPACs since 2015, 27% of them have earnout provisions for sponsor promotes (see Panel A of Table 11). This percentage is zero for 2016 (the first year with completed mergers for these SPAC IPOs), 8% for 2017, 17% for 2018, 32% for 2019, 34% for 2020, and 25% for the first quarter of 2021. The inclusion of these vesting provisions mitigates the concerns about the sponsor incentives.[27]

Then why has there been a boom in the SPAC market in 2020 and 2021? For many years, sponsors and hedge fund IPO investors both earned attractive returns on SPACs, but the scarce factors were finding quality operating companies to merge with and investors to buy the SPAC shares at the time of the merger when hedge funds exited. In 2017-2019, for example, nine SPACs liquidated and of the completed mergers, 44 out of 64 (69%) had more than 50% of the shares redeemed. PIPE investments in many cases made up some or all of the cash that public market investors redeemed, allowing the merger to be completed. Thus, although it may have been quicker to complete a merger with a SPAC than to go public with a traditional IPO, contrary to the often repeated statement that merging with a SPAC exposed an operating company to less uncertainty about deal completion and proceeds raised, the evidence is that an operating company was exposed to substantial uncertainty about the amount of cash that could be delivered.

In 2020, 62 mergers were completed and only two SPACs liquidated. Of the 62 mergers, only 25 out of 62 (40%) had 50% or more of the SPAC shares redeemed. In the fourth quarter, there were 0 liquidations and 37 completed mergers, with only 10 out of 37 (27%) having 50% or more of the SPAC shares redeemed.

NASDAQ), the merger agreement states that "If, at any time during the period of three years following the Closing Date, the closing price of the shares of the Company (i) exceeds $12.50 per share for 20 out of any 30 consecutive trading days, then 6,212,500 shares will be released from escrow...." Double Eagle has additional shares that are subjected to a $15 threshold, and the earnout provisions are contingent on the public share redemptions. See https://www.sec.gov/Archives/edgar/data/0001647088/000110465917071936/a17-27887_28k.htm (retrieved as of July 2021) for more details. Multiple thresholds, which are typically two, are common.

[27] In Section A3 of the Appendix, we provide another example of a contingent contract, focusing on the sponsor compensation.

Thus, what changed in 2020, especially the last quarter, was that investor sentiment towards the mergers became much more positive, allowing the sponsors to complete deals because the cash raised in the IPO was unlikely to be redeemed. For operating companies, the probability that a merger would be completed and substantial cash delivered increased, making merging with a SPAC more attractive than it had been. PIPE investments also became more common, providing additional cash and assurance that the merger would be completed.

Why did investor sentiment change in 2020? We posit that the high returns earned on several high-profile deals, including the October 2019 Virgin Galactic merger, the March 2020 Betterware merger, the April 2020 DraftKings merger, and the June 2020 Nikola and Open Lending mergers, led to an inflow of retail investors chasing past returns. The high returns continued into February 2021, when the returns on both pre-deal, announced deal, and completed deal SPACs peaked and then turned negative. Because of the relative speed with which a SPAC IPO can be completed, 298 SPAC IPOs occurred in the first quarter of 2021 alone, before a rapid deceleration occurred. During the second and third quarters, 149 SPAC IPOs occurred, still an annualized pace of 298 IPOs.

As we have noted in Figure 3, the fraction of a warrant offered in a SPAC unit fell dramatically from the beginning of 2018 to the beginning of 2021, as sponsors found it easier to attract IPO investors. The lower warrant fraction left a larger slice of the pie for other stakeholders, including the operating company. SPAC IPO activity dropped dramatically in April 2021 due, in part, to increasing concerns about an oversupply of SPACs ("too much money chasing deals") and concerns raised by the U.S. SEC. The SEC questioned whether sponsor warrants should be expensed (much as employee stock options, which are also warrants, are), and whether the regulatory arbitrage discussed in Section 2 is in fact present.

6. Sponsor and Underwriter Compensation Renegotiation

In this section, we discuss the compensation of SPAC sponsors and SPAC IPO underwriters. For the traditional IPO, a number of papers discuss the direct costs of going public, of which the largest is the underwriting commission. The indirect costs of IPOs, most notably the underpricing, have been studied extensively as well (e.g., Loughran and Ritter (2002), among others). Many

other papers focus on opaque compensation structures, especially how general partners are paid in the private equity industry (Metrick and Yasuda (2010), Chung, Sensoy, Stern, and Weisbach (2012), Robinson and Sensoy (2013), and Phalippou et al. (2018), among others). A recent study by Phalippou (2020) shows that from 2006-2019, private equity limited partners on average earned no abnormal returns, while general partners earned enormous fees.

SPAC sponsors' compensation has also been spotlighted. For example, in September 2020, then SEC Chairman Jay Clayton mentioned that the SEC was focusing on SPAC sponsors' incentives and compensation.[28] We examine sponsor promotes and underwriting commissions from a new angle – the downward renegotiation of their compensation. In Table 11, we report the ex-post renegotiation outcome of sponsor promotes and underwriter deferred commissions by focusing on the 153 business combinations by SPAC IPOs from 2015 or later that were completed by March 2021. We collect the relevant data from EDGAR filings and SPAC Research. SPAC merger agreements can include vesting (earnout) provisions for sponsor promotes, typically tied to future stock prices of the merged company. such contingent cases, we report the summary statistics on the shares subject to the vesting provisions but treat these shares as not being forfeited, to conservatively report the frequency and magnitude of sponsor compensation renegotiations.

— Place Table 11 About Here —

We split the 153 completed mergers into groups with below- and above-median redemption ratios. As a typical definitive agreement for a business combination specifies a minimum amount of capital to be delivered to the merging company, a sponsor's realized compensation is influenced by the SPAC shareholder redemption decisions. Panel A shows that the average redemption ratio for the below-median redemption group is 2% while it is 73% for the above-median group, confirming the bimodal nature of SPAC shareholder redemption decisions implied by the optimal redemption strategy. It also documents that even for business combinations with low redemption ratios, sponsors surrender some of their promote common shares in 39% of the deals and private placement warrants in 21% of the deals. For business combinations with high redemption ratios, sponsors more frequently forfeit their common

[28] https://www.cnbc.com/video/2020/09/24/sec-chairman-jay-clayton-on-disclosure-concerns-surround-going-public-through-a-spac.html - Retrieved as of July 2021.

shares and warrants. In Panel B of Table 11, we report the magnitudes of these forfeitures, and the same pattern arises – while sponsors surrender 9% of their promote common shares on average for business combinations with low redemption ratios, they forfeit 25% of their promote common shares for high redemption deals. The percentages of forfeitures of private placement warrants are 12% and 26%, respectively, for low and high redemption groups.

For underwriters, it is common for them to receive 2% of the 5.5% underwriting commission at the time of the IPO for all shares sold, but the remaining 3.5% is deferred until the business combination. The renegotiations of the deferred underwriter commissions show the same pattern as sponsor promotes: underwriters give up some portion of their commissions more often for higher redemption deals, although it is not as frequent as sponsor haircuts. Conditional on non-zero forfeiture, the average total underwriting commission including the already paid up-front fee becomes 3.65% (2% + 3.5% x (1 – 53%)), instead of 5.5%.

We then focus on the extra payments that are offered to various investors to induce their investments. New capital, including both FPA and PIPE investments, has become an important component for many SPAC mergers. Table 11 reports that 80% of the business combinations involve new capital. The amount of new capital contributed differs across deals, and the format also varies, as some include preferred shares and convertible debt.[29] On average, new capital accounts for 41% of total cash delivered to merging companies.

PIPE investments serve two important functions. The PIPE investment, when done by an outside entity such as a private equity firm or a mutual fund, serves to certify that the deal is attractive, and thus discourages redemptions. In addition, if there are substantial redemptions, the PIPE investment provides capital to meet the minimum cash requirement of a merger agreement.

We measure inducements by dividing the number of common shares and/or warrants granted to various parties by the number of sponsor promote common shares and/or warrants. Investors can receive shares, warrants, or both as inducements. We measure these two types separately, and the average inducements are 7% for common shares and 22% for warrants. PIPE investors and non-redeeming SPAC investors often receive these

[29]We include investments in preferred equity and convertible debt as part of the new capital in Table 11. Many business combinations in recent years also involve syndicated loans. We do not count these loans arranged along with the merger as part of the new capital.

inducements from the forfeited shares or warrants by the sponsor. Our interpretation is that sponsors transfer some of the stock and warrants to PIPE investors to keep weak deals from collapsing, and underwriters forego some of their deferred compensation for the same reason. It is noteworthy that, sometimes, the inducements are larger than the sponsor haircuts, which happens when merging company shareholders also pay part of the inducements, in the process diluting their ownership (or equivalently, reducing the pre-money valuation of the operating company). Therefore, the inducement depends on the bargaining power dynamics during the deSPACing process (between the announcement of a definitive merger agreement and the completion of a business combination).[30]

With all these considerations and adjustments, Panel B of Table 11 reports that the mean and median cash delivered per share numbers are $7.48 and $8.13, respectively. Our per share cash numbers are higher than the median of $5.70 per share for 47 SPACs between January 2019 and June 2020 in Klausner et al. (2021) for two reasons. First, Klausner et al. (2021) subtract the value of both public and private placement (sponsor) warrants in the calculation of cash delivered. We include the value of warrants in calculating the costs of going public via merging with a SPAC in Panel A of Table 1, but we do not subtract the value of warrants in calculating the per share cash delivered in Panel B of Table 11 because these warrants do not have any cash implications at the merger. Second, in their sample period, there were higher redemptions and fewer PIPE investments than in our longer sample period.

Our measure of sponsor haircuts and inducements in Table 11 should be understood as a lower bound. For example, in some PIPE deals, the sponsor paid placement agent fees.[31] The payment came from the sponsor's own pocket, but we do not include them as haircuts or inducements as the payment is not based on sponsor promotes or warrants. Not all of these types of transactions (e.g., sponsors providing benefits to PIPE investors at their own expense) are easily identified in EDGAR filings.

[30]The forfeitures of sponsor shares or warrants can happen with investor inducements. When both sponsor forfeitures and investor inducements exist, forfeitures are generally greater than the inducements, reducing the diluting effect of these sponsor promotes for the operating company.

[31]For example, "*Certain offering related expenses were paid by Nebula Acquisition Corp (sponsor), including customary fees payable to the placement agents, Deutsche Bank Securities Inc. ("Deutsche Bank") and Goldman Sachs & Co., LLC ("Goldman Sachs")*." https://www.sec.gov/Archives/edgar/data/1806201/000119312520150226/d921991d424b3.htm

Analysis of Table 11 leads to an important conclusion that has not been emphasized in the financial press or the academic literature – the sponsor's slice of the pie is often reduced when a merger occurs. On average, sponsors forfeit 17% of the common shares they receive as promotes and 19% of their private placement warrants. Furthermore, 11% of the promotes are on average subject to vesting provisions, and the shares that they retain are also subject to lockup provisions that usually last at least one year.[32] Since sponsors often invest their own capital as PIPE investors, the sponsor's actual profit would be even lower for weak deals as the stock price tends to drop below the IPO price, which is usually the price that sponsors pay to purchase common shares as a PIPE investor.

7. Conclusions

We analyze the economic structure of SPACs, focusing on the three key participants in the market: investors, operating companies, and sponsors. From an investor's point of view, between the SPAC IPO and the business combination or liquidation, we find lucrative risk-adjusted returns considering the downside protected nature of the investment. Specifically, for 210 SPAC IPOs purchased at the offer price from January 2010 – December 2019, the average annualized return during this SPAC period has been 15.9%, with all 210 returns being positive. Investing in SPAC IPOs can be viewed as investing in underpriced *default-free* convertible bonds with extra warrants. Our back of the envelope calculation shows that the SPAC IPO investors are being given free warrants.

On the other hand, investor returns in the deSPAC period on the merged companies are mixed. For the 114 SPACs that completed a merger with an operating company from January 2012 – September 2020, weighting each deal equally, common share investors have lost money on average, while warrant investors have earned positive returns. The equally weighted average one-year return on the merged company shares has been -8.1%, underperforming the market by 24.7%. However, investor returns on a dollar-weighted basis are not as bad as the EW numbers would suggest, with a dollar-weighted average return of 4.5%. This improvement

[32] Klausner et al. (2021) also use net promotes (i.e., after forfeitures) when they discuss sponsor profits.

is due to the tendency for investors to redeem many of the shares for the mergers that generate disappointing subsequent returns. For the 105 out of 114 merged companies that had outstanding warrants, the EW average one-year return has been 68.0%. Consequently, focusing exclusively on the EW common share returns paints a worse picture of the deSPAC period investment returns than the average public investor experience.

From a private operating company's point of view, we show that merging with a SPAC is much more expensive than a traditional IPO. The cost to the median company of going public, as a percentage of post-merger or post-issue market cap, is 14.6% when merging with a SPAC, vs. 3.2% when using a traditional IPO. Then why do some companies still choose a SPAC merger over a traditional IPO? We identify the economic roles of SPAC sponsors and SPAC IPO investors and how these roles can create relative advantages of merging with a SPAC.

Specifically, for some operating companies, it is believed that merging with a SPAC is a quicker way to raise capital and go public than a traditional IPO. Although our numbers do not support the idea that merging with a SPAC is necessarily faster than conducting a traditional IPO, we posit that the conventional wisdom that 'merging with a SPAC is faster' influences the decision making. For operating companies that do not already have audited financial statements, merging with a SPAC may indeed be faster than a traditional IPO. Importantly, until recently, the conventional wisdom was that the merger permits the sponsor to make forward-looking statements that fall under the safe harbor provisions of U.S. merger law, whereas a traditional IPO does not offer these safe harbor provisions, although recent statements from the SEC may reduce this regulatory arbitrage. Furthermore, the redemption option that SPAC public shareholders have incentivizes the SPAC sponsor to negotiate a deal that is favorable to both the operating company and the SPAC shareholders, in order to induce the shareholders to approve the merger and not redeem their shares. Alternatively stated, the redemption option helps align sponsor and public shareholder interests.

We document that the sponsors frequently take haircuts in order to ensure that the SPAC has enough cash to consummate the merger. Sponsors often give up some of their shares (17% on average) and/or warrants (19% on average). Frequently, these forfeitures are transferred to some existing shareholders to induce them not to redeem, or to PIPE investors to induce

them to inject cash. Furthermore, the IPO underwriters sometimes agree to forego some of their deferred compensation to ensure the completion of a merger. Importantly, these haircuts are state-contingent: sponsors take larger haircuts and provide more inducements, and underwriters surrender commissions more, for weaker deals. Increasingly, some sponsor shares are subject to vesting provisions, resulting in additional forfeitures if stock price targets are not achieved. Thus, we show that average sponsor profits are not as lucrative as sometimes assumed, especially for underperforming deals.

The SPAC market has experienced rapid changes recently. In the first quarter of 2021, 298 SPACs went public with an average first-day return of 3.7%. This is a significant jump from the 1.6% average in 2020, which was already higher compared to prior years. Until the end of 2020, the SPAC period return was mostly realized when the merger is announced. However, the average first-day return of 3.7% in the first quarter of 2021 shows that the market started to reprice the SPAC units immediately, reducing the abnormal returns for investors who purchase SPACs in the market, similar to what we find for operating company IPOs. The first-day jumps disappeared in the second quarter of 2021, as the competition among hundreds of SPACs lowered the expected returns.

On a point forward basis, there are reasons to believe that deSPAC period returns may still be disappointing, but SPACs may stay as an alternative to traditional IPOs. The 248 SPACs that went public in 2020, combined with the flood of 447 SPAC IPOs in the first three quarters of 2021, raise the possibility that too many SPACs are chasing deals, increasing the valuations that operating companies can negotiate. The high prices paid will reduce subsequent deSPAC period returns. On the other hand, the terms of SPAC IPOs are being adjusted, with a downtrend in the fraction of shares that each warrant in a unit will buy (or a lower fraction of a warrant to buy one share), implying less dilution when a merger is consummated. This change limits SPAC period investors' returns by reducing the wealth transfer from deSPAC period shareholders to SPAC period unitholders. Some SPAC IPOs, as well as follow-on merger negotiations, have started to offer contingent sponsor compensation and contingent warrants, incentivizing sponsors to find better deals and SPAC period investors not to redeem. We view the market as adjusting toward a more sustainable equilibrium.

References

Bai, J., A. Ma, and M. Zheng (2021): "Reaching for Yield in the Going-Public Market: Evidence from SPACs," *SSRN Working Paper*.

Blomkvist, M. and M. Vulanovic (2020): "SPAC IPO waves," *Economics Letters*, 197, 109645.

Carter, R. and S. Manaster (1990): "Initial Public Offerings and Underwriter Reputation," *Journal of Finance*, 45, 1045–1067.

Carter, R. B., F. H. Dark, and A. K. Singh (1998): "Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks," *Journal of Finance*, 53, 285–311.

Cazier, R. A., K. J. Merkley, and J. S. Treu (2020): "When are Firms Sued for Qualitative Disclosures? Implications of the Safe Harbor for Forward-Looking Statements," *The Accounting Review*, 95, 31–55.

Chaplinsky, S., K. W. Hanley, and K. Moon (2017): "The JOBS Act and the Costs of Going Public," *Journal of Accounting Research*, 55, 795–836.

Chung, J.-W., B. A. Sensoy, L. Stern, and M. S. Weisbach (2012): "Pay for Performance from Future Fund Flows: The Case of Private Equity," *Review of Financial Studies*, 25, 3259–3304.

Cumming, D., L. H. Hass, and D. Schweizer (2014): "The Fast Track IPO – Success Factors for Taking Firms Public with SPACs," *Journal of Banking & Finance*, 47, 198–213.

Degeorge, F., J. Martin, and L. Phalippou (2016): "On Secondary Buyouts," *Journal of Financial Economics*, 120, 124–145.

Dimitrova, L. (2017): "Perverse Incentives of Special Purpose Acquisition Companies, the "Poor Man's Private Equity Funds"," *Journal of Accounting and Economics*, 63, 99–120.

Fama, E. F. and K. R. French (1993): "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics*, 33, 3–56.

Fernando, C. S., V. A. Gatchev, and P. A. Spindt (2005): "Wanna Dance? How Firms and Underwriters Choose Each Other," *Journal of Finance*, 60, 2437–2469.

Gryglewicz, S., B. Hartman-Glaser, and S. Mayer (2021): "PE for the Public: The Rise of SPACs," *SSRN Electronic Journal*.

Hong, H. and J. C. Stein (1999): "A Unified Theory of Underreaction, Momentum Trading, and Overreaction in Asset Markets," *Journal of Finance*, 54, 2143–2184.

Howe, J. and S. O'Brien (2012): "SPAC Performance, Ownership, and Corporate Governance," *Advances in Financial Economics*, 15, 1–14.

Hsu, D. H. (2004): "What Do Entrepreneurs Pay for Venture Capital Affiliation?" *Journal of Finance*, 59, 1805–1844.

Jenkinson, T. and M. Sousa (2011): "Why SPAC Investors Should Listen to the Market," *Journal of Applied Finance*, 21, 38–57.

Kiesel, F., N. Klingelhofer, D. Schiereck, and S. Vismara (2021): "deSPACS," *Working Paper*.

Klausner, M. D., M. Ohlrogge, and E. Ruan (2021): "A Sober Look at SPACs," *SSRN Working Paper*.

Lakicevic, M. and M. Vulanovic (2013): "A story on SPACs," *Managerial Finance*, 39, 384–403.

Lewellen, S. (2009): "SPACs as an Asset Class," *SSRN Working Paper*.

Lin, C., F. Lu, R. Michaely, and S. Qin (2021): "SPAC IPOs and Sponsor Network Centrality," *SSRN Working Paper*, 59.

Loughran, T. and J. R. Ritter (2002): "Why Don't Issuers Get Upset About Leaving Money on the Table in IPOs?" *Review of Financial Studies*, 15, 413–443.

——— (2004): "Why Has IPO Underpricing Changed Over Time?" *Financial Management*, 33, 5–37.

Metrick, A. and A. Yasuda (2010): "The Economics of Private Equity Funds," *Review of Financial Studies*, 23, 2303–2341.

Phalippou, L. (2020): "An Inconvenient Fact: Private Equity Returns and the Billionaire Factory," *Journal of Investing*, 30, 11–39.

Phalippou, L., C. Rauch, and M. Umber (2018): "Private Equity Portfolio Company Fees," *Journal of Financial Economics*, 129, 559–585.

Renaissance Capital, I. (2020): "SPAC Returns Fall Short of Traditional IPO Returns on Average," *Renaissance Capital Blog Post Report*.

Ritter, J. R. (2020): "IPO Statistics for 2020 and Earlier Years," *https://site.warrington.ufl.edu/ritter/files/IPO-Statistics.pdf*.

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

Rodrigues, U. and M. Stegemoller (2013): "Exit, Voice, and Reputation: The Evolution of SPACs," *Delaware Journal of Corporate Law*, 37, 849–927.

Stulz, R. M. (2020): "Public versus Private Equity," *Oxford Review of Economic Policy*, 36, 275–290.

Vulanovic, M. (2017): "SPACs: Post-Merger Survival," *Managerial Finance*, 43, 679–699.

Figure 1. Number of SPAC IPOs and Proceeds

Figure 1 reports SPAC IPO activities between January 2010 and September 2021 – the number of SPAC IPOs (dotted line, left axis) and total proceeds (bar, right axis). We exclude 15 SPAC IPOs that were only traded in Over-The-Counter (OTC) markets. Proceeds do not include underwriter over-allotment options, are adjusted to January 2021 purchasing power using the CPI, and are reported in billions of dollars.

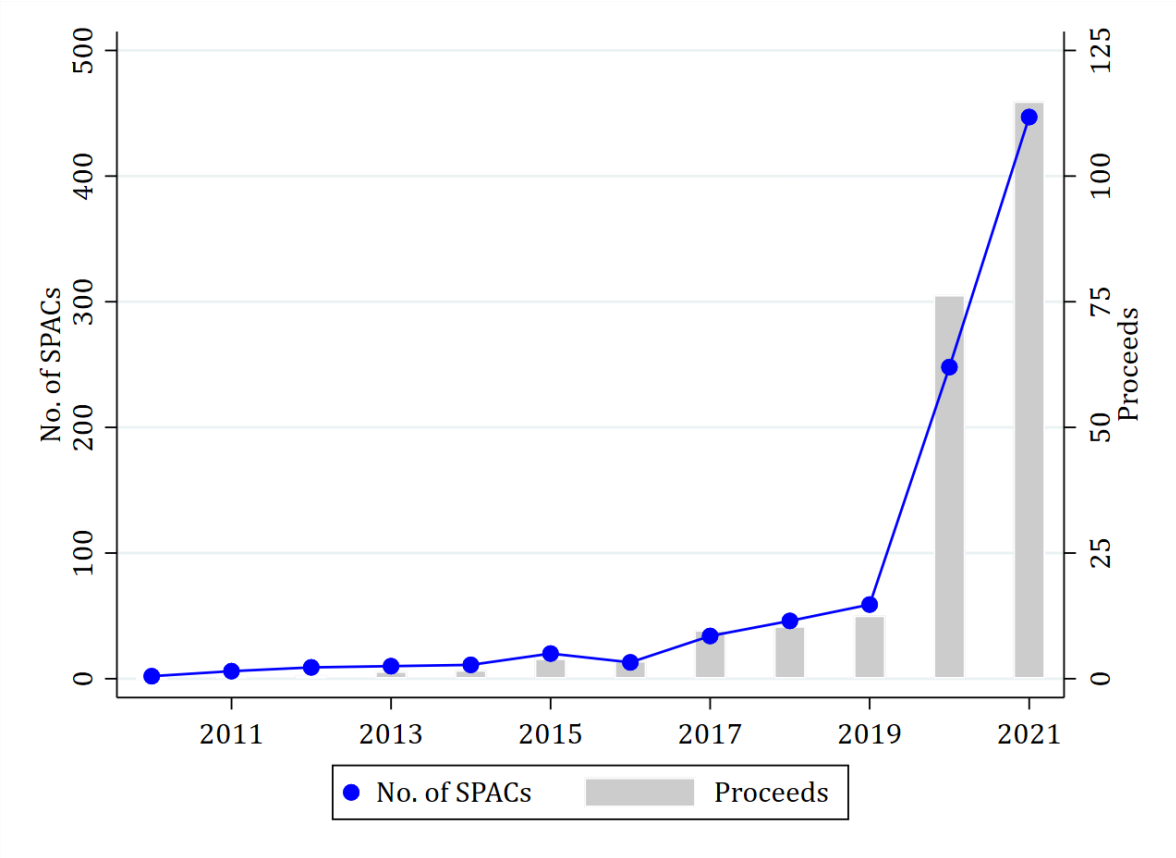
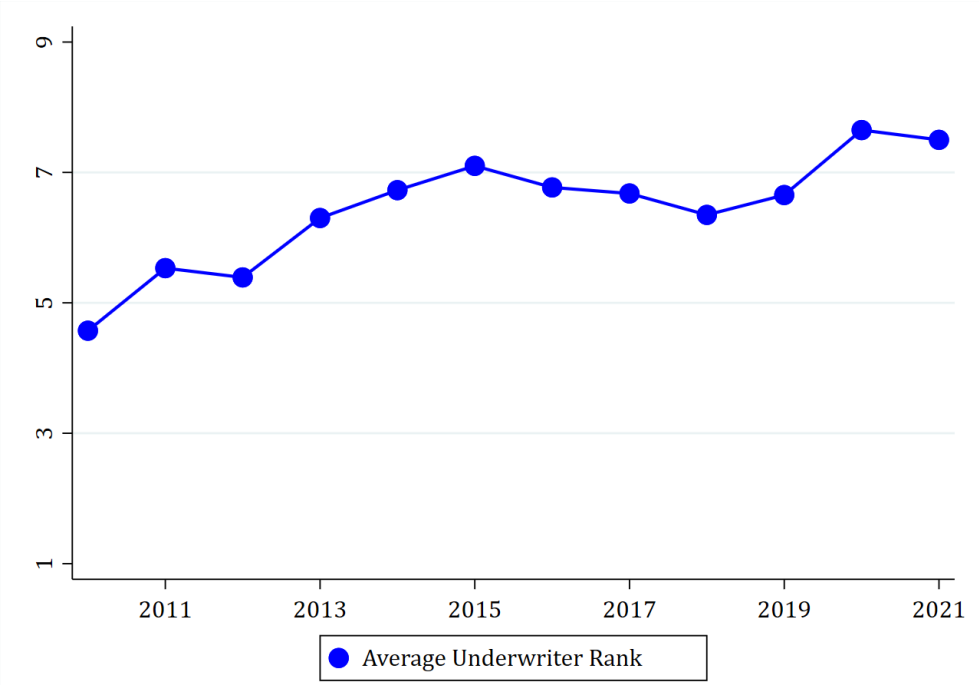


Figure 2. Underwriters

Panel A reports the equally weighted average lead left underwriters' reputation ranks between January 2010 and September 2021. The reputation ranks are from Loughran and Ritter (2004), defined as the prestige rank on a 1 to 9 scale (9 for high prestige) following Carter and Manaster (1990). Panel B reports the combined market share of three prestigious underwriters - Goldman Sachs, Morgan Stanley, and J.P. Morgan. Each IPO is weighted equally.

Panel A. Underwriter Rank Over Time



Panel B. Three Prestigious Underwriters

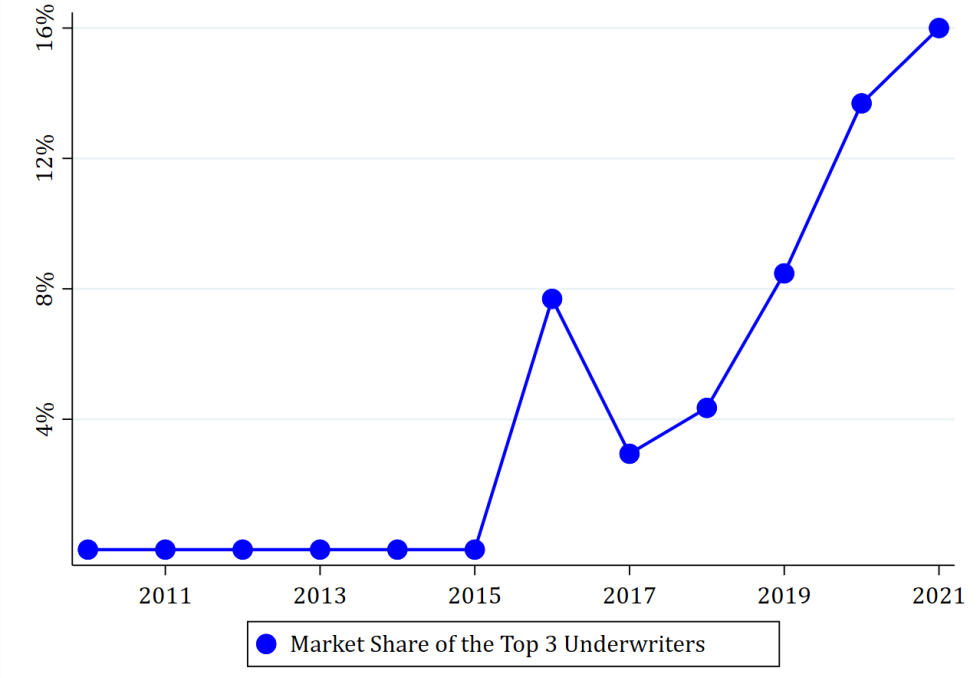


Figure 3. The Recent Evolution of the SPAC Market

Figure 3 shows the evolution of the SPAC market from the first quarter of 2018 to the third quarter of 2021. We report the quarterly averages of the dilution per unit (blue dots, left axis) and the SPAC IPO first-day return (red triangles, right axis). The first-day return is defined as (the closing market price on the first-day of trading − the offer price) / the offer price. Dilution per unit is the fraction of a common share that derivative securities included in a unit can convert into, expressed as a percentage of a share. For example, if SPAC A's unit comes with one common share and a quarter of a warrant, and if one warrant can convert into a common share, we classify SPAC A as having a 25% dilution. If SPAC B's unit comes with one common share, one warrant, and one right, and if a warrant converts to a common share and a right converts to one-tenth of a common share, we classify SPAC B as having a 110% dilution.

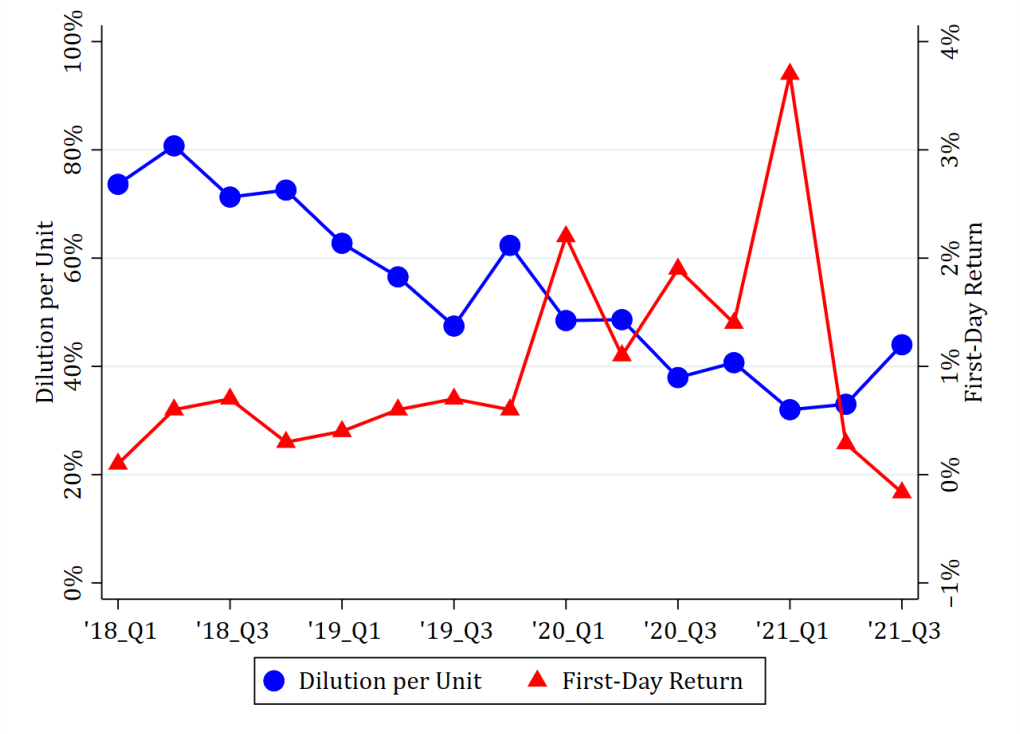


Table 1. The Relative Costs of Going Public and the Speed of Merging with a SPAC

Panel A reports the costs, not including registration, legal, and auditing fees, of three different going public methods: merging with a SPAC, a traditional IPO, or a direct listing. For both SPACs and traditional IPOs, the costs are defined to be the difference between the market value of "outside" securities and the net cash received by the operating company and selling shareholders. For SPACs, outside securities are shares and warrants held by public investors, PIPE investors, and sponsors. For traditional IPOs, outside securities are the shares issued in the IPO. For direct listings, the costs are the fees paid to financial advisors. For traditional IPOs, our cost measure is equivalent to the sum of underwriting commissions plus money left on the table. We use 150 SPAC mergers (after excluding 3 deals in which no cash was delivered due to high redemptions and no PIPE investment), 677 traditional IPOs, and 7 direct listings between January 2015 and March 2021. For the denominator, proceeds refer to the net cash delivered after underwriting commissions and other costs. Market cap refers to the post-merger (or post-issuance) market capitalization valued at the first closing market price. For SPAC mergers, cash delivered includes the dollar value of the trust account and the proceeds from the realized forward purchase agreement (FPA) and PIPE investments. For the traditional IPOs, we exclude IPOs raising more than $500 million, those with an offer price below $5 per share, unit offers, ADRs, closed-end funds, natural resource limited partnerships, REITs, bank and S&L IPOs, and small best efforts offers. **Panel B** reports average and median days between merger announcements and completion of business combinations based on the year of merger announcements. The sample consists of 267 merger intent announcements between January 2017 and March 2021. There were 9 merger announcements in 2020 and 2021 that did not complete the business combination as of October 31, 2021. For these 9 announcements, we include the days between announcement and October 31, 2021.

Panel A. The Relative Costs of Going Public

	SPAC (N=150)		Traditional IPO (N=677)		Direct Listing (N=7)	
	Costs / Proceeds	Costs / Market Cap	Costs / Proceeds	Costs / Market Cap	Costs / Proceeds	Costs / Market Cap
10th percentile	16.1%	4.6%	-4.1%	-0.8%	-	0.1%
25th percentile	29.3%	8.3%	6.9%	1.1%	-	0.1%
Median	48.3%	14.6%	21.9%	3.2%	-	0.3%
75th percentile	88.9%	27.9%	49.9%	7.1%	-	1.1%

Panel B. Days between Merger Announcements and Business Combinations

Year	No. of Announcements	Average Days	Median Days
2017	16	138	140
2018	29	161	147
2019	36	174	143
2020	96	132	121
2021(Q1)	90	172	164
Total	**267**	**154**	**148**

Table 2. Characteristics of Companies Merging with SPACs and Conducting an IPO

Panel A compares the observable characteristics of companies merging with SPACs and companies conducting a traditional IPO (or a direct listing). The sample consists of 145 business combinations and 1,080 traditional IPOs and direct listings between January 2013 and December 2020. Sales are measured based on the last 12 months (LTM) revenue prior to the listing date, adjusted to January 2021 purchasing power and reported in millions. Age is calculated as the difference between the calendar year of listing and the founding year, capped at 80 years. Profitability is a (0,1) dummy variable based on the LTM pro forma net income prior to the listing date (or the previous fiscal year if the LTM net income is not available). For industry classification, we follow Jay Ritter's SIC code based classification (see Ritter (2020)) for tech and biotech companies. For energy companies, we include gold, mines, coal, oil, and utility industries from the Fama-French 49 Industry Portfolio classification on Ken French's website. Countries refer to the main country of operation. **Panel B** reports results from Probit models (1 = SPAC merger, 0 = IPO or direct listing) defined in equation (1), given by

$$Merging\ with\ a\ SPAC_i = a * Ln(sales)_i + b * Ln(age)_i + c * Profitable_i + d * Tech_i + e * Biotech_i + e_i$$

Panel A. Comparing Observable Characteristics

	Firms Merging with SPACs				Firms Doing a Traditional IPO			
	Average	25%	50%	75%	Average	25%	50%	75%
Sales ($M)	377	25	149	424	742	1	74	379
Age (Years)	19	6	11	25	16	6	10	17
Profitable	31%				27%			
Industry								
Tech	24%				28%			
Biotech	8%				37%			
Energy	9%				4%			
Others	59%				31%			
Countries								
USA	76%				77%			
Foreign	24%				23%			
(China)	10%				11%			

Panel B. Probit Regressions

	Merging with a SPAC = 1			
	(1)	(2)	(3)	(4)
Log(Sales)	0.050**	-0.091***	0.076***	-0.067**
	(0.023)	(0.030)	(0.025)	(0.032)
Log(Age)	-0.002	0.048	-0.052	-0.007
	(0.066)	(0.069)	(0.071)	(0.074)
Profitable Dummy	-0.007	-0.098	0.094	-0.036
	(0.113)	(0.118)	(0.121)	(0.126)
Tech Dummy		-0.122		-0.279**
		(0.111)		(0.120)
Biotech Dummy		-1.412***		-1.609***
		(0.186)		(0.204)
Year FE	No	No	Yes	Yes
N. Observations	1,225	1,225	1,225	1,225
Pseudo R-sq	0.009	0.086	0.127	0.207

Table 3. SPAC and Operating Company IPOs

There are 905 SPAC IPOs between January 2010 and September 2021 after excluding 15 IPOs from 2010-2011 only traded in Over-The-Counter (OTC) markets. For the same period, there are 1,581 traditional, operating company IPOs after excluding those with an offer price below $5 per share, unit offers, ADRs, closed-end funds, natural resource limited partnerships, REITs, bank and S&L IPOs, and small best efforts offers. Proceeds do not include underwriter over-allotment options, are adjusted to January 2021 purchasing power using the CPI, and are reported in millions of dollars.

	Number of IPOs		Total Proceeds ($m)		Average Proceeds ($m)	
Year	SPAC	Operating	SPAC	Operating	SPAC	Operating
2010	2	91	125	35,985	63	395
2011	6	81	536	32,027	89	395
2012	9	93	548	35,915	61	386
2013	10	158	1,504	47,192	150	299
2014	11	206	1,738	47,162	158	229
2015	20	118	4,049	24,613	202	209
2016	13	75	3,561	13,826	274	184
2017	34	106	9,690	24,753	285	234
2018	46	134	10,478	35,295	228	263
2019	59	112	12,590	40,718	213	364
2020	248	165	76,373	62,742	308	380
2021(Q3)	447	242	114,890	86,695	257	359
Total	**905**	**1,581**	**236,083**	**487,193**	**261**	**308**

Table 4. SPAC Period Returns

Panel A reports equally weighted annualized SPAC period returns for SPACs that went public between January 2010 and December 2019 that were exchange-listed based on equation (2). We calculate annualized returns based on the optimal redemption strategy in which an investor purchases a SPAC unit at the offer price and sells (or redeems, if redemption is available and the redemption value is higher than the market price) each component of the SPAC unit at the closing price of five trading days prior to the consummation of a business combination or liquidation. To avoid any look-ahead bias in the return calculations, we include 6 ongoing SPACs as of September 30, 2021 and use market prices at the end of September 2021 for their returns. **Panel B** reports the average returns and duration (average months) based on the status of these 210 SPACs. Average months refer to the months between the SPAC IPO date and a business combination completion date, the liquidation date, or September 30, 2021 (for ongoing SPACs). **Panel C** reports annualized SPAC period returns based on equally weighting, SPAC IPO proceeds weighting, and the median for the 210 SPAC IPOs.

Panel A. Based on Year of SPAC IPO

Year	Number of SPACs	Annualized Returns
2010	2	1.4%
2011	6	3.4%
2012	9	3.9%
2013	10	11.0%
2014	11	5.4%
2015	20	6.1%
2016	13	19.6%
2017	34	9.5%
2018	46	19.1%
2019	59	26.1%
Total	**210**	**15.9%**

Panel B. Based on Outcomes

Outcome	Number of SPACs	Annualized Returns	Average Months
Merger Completed	185	17.7%	21.3
Liquidated	19	2.0%	26.8
Ongoing	6	4.8%	28.7
Total	**210**	**15.9%**	**22.0**

Panel C. Different Weighting Methods

	Annualized Returns
Equally Weighted Mean	15.9%
IPO Proceeds Weighted Mean	19.0%
Median	6.4%

Table 5. deSPAC Period Common Share Returns

Panel A reports average equally weighted deSPAC period common share returns based on a buy-and-hold strategy (equation (3)) in which an investor purchases common shares of a merged company on the first day of trading as a new entity and holds them for one year or three years. The year column represents the year of the merger. The sample consists of 114 business combinations consummated between January 2010 and September 2020. The returns include dividend yields and capital gains. When the full one-year or three-year data are not available, we calculate the returns based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 for both one-year and three-year returns (not annualized). Returns end on September 30, 2021. The CRSP return is the total return on the CRSP value-weighted market index, matched to each investment period. **Panel B** reports average deSPAC period common share returns based on equally weighting, post-merger market capitalization weighting, SPAC IPO proceeds weighting, public cash weighting, and the median returns. Public cash is the actual cash delivered to the merging companies from public SPAC shareholders, defined as *Initial Trust* $\times$ *(1 − Redemption Ratio)*.

Panel A. Common Shares

		One Year Returns			Three Year Returns		
Year	Number	SPACs	CRSP	Diff.	SPACs	CRSP	Diff.
2010	0	-	-	-	-	-	-
2011	0	-	-	-	-	-	-
2012	1	-53.2%	20.4%	-73.6%	-98.1%	37.2%	-135.3%
2013	5	-30.1%	17.9%	-48.0%	-41.1%	28.0%	-69.1%
2014	4	-51.6%	5.7%	-57.3%	-89.6%	26.7%	-116.2%
2015	9	-19.5%	0.7%	-20.2%	87.7%	33.1%	54.6%
2016	9	-5.2%	19.0%	-24.2%	-35.1%	40.3%	-75.3%
2017	13	-11.0%	11.7%	-22.6%	-44.5%	30.3%	-74.7%
2018	23	-35.0%	8.8%	-43.8%	-7.0%	48.4%	-55.4%
2019	25	2.0%	8.8%	-6.8%	29.8%	45.2%	-15.5%
2020	25	24.0%	39.9%	-15.9%	10.5%	44.3%	-33.8%
Total	**114**	**-8.1%**	**16.5%**	**-24.7%**	**0.7%**	**41.1%**	**-40.4%**

Panel B. Different Weighting Methods

	One Year Returns	Three Year Returns
Equally Weighted Mean	-8.1%	0.7%
Post-Merger Market Cap Weighted Mean	6.7%	-2.8%
IPO Proceeds Weighted Mean	-3.8%	2.3%
Public Cash Weighted Mean	4.5%	8.1%
Median	-21.2%	-22.0%

Table 6. deSPAC Period Common Share Returns − Fama and French's Three Factor Model

Table 6 reports the regression results based on the Fama and French (1993) three-factor model as defined in equation (5).

$$R_{p,t} - R_{f,t} = a + b * (R_{m,t} - R_{f,t}) + c * SMB_t + d * HML_t + e_{p,t}$$

We form a portfolio when there are at least two observations for a given month. Firms are added to the portfolio in the calendar month following a business combination, and kept in the portfolio for 12 months or 36 months, respectively, unless they are delisted earlier. Based on our sample of SPACs that went public in 2010 and later that were exchange-listed, the first business combination occurred in October 2012 and the second in February 2013. Accordingly, the sample period starts in March 2013 and ends in September 2021, forming 103 monthly portfolios. Market is the excess return of the value-weighted CRSP index, SMB is the return on small stocks minus the return on big stocks, and HML is the return on high book-to-market firms minus the return on low book-to-market firms, all measured for a given month. An alpha of -0.017 is -1.7% per month. Standard errors are reported in parentheses. Statistical significance levels: *** p-value<0.01, ** p-value<0.05, * p-value<0.10.

	One-Year deSPAC Common Returns		*Three-Year deSPAC Common Returns*	
	Equally Weighted	Value-Weighted	Equally Weighted	Value-Weighted
	(1)	(2)	(3)	(4)
Alpha	-0.010	-0.017*	-0.008	-0.019**
	(0.010)	(0.009)	(0.010)	(0.009)
Market	1.098***	1.167***	1.095***	1.109***
	(0.240)	(0.226)	(0.245)	(0.220)
SMB	1.130***	0.961***	1.150***	0.888**
	(0.371)	(0.350)	(0.379)	(0.341)
HML	0.395	-0.137	0.404	-0.0476
	(0.295)	(0.278)	(0.301)	(0.271)
N. Obs	103	103	103	103
Adj. R-Sq	0.315	0.304	0.308	0.292

Table 7. deSPAC Period Warrant Returns

Panel A reports equally weighted deSPAC period warrant returns based on a buy-and-hold strategy (equation (4)) in which an investor purchases a merged company warrants on the first day of trading as a new entity and holds them for one year or three years. The year column represents the year of the merger. Panel A reports returns on warrants for 105 out of 114 business combinations that have warrants, consummated between January 2010 and September 2020. Returns end on September 30, 2021. Returns include capital gains only, as warrants do not pay dividends. 'Units' column represents a deSPAC period investment strategy (mix of common shares and warrants) replicating the initial specification of the SPAC IPO unit. When the full one-year or three-year data are not available, we calculate the returns based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 as both one-year and three-year returns (not annualized). **Panel B** reports deSPAC period warrant returns, based on equally weighting, SPAC IPO proceeds weighting, the warrant price at the first trading day as a deSPAC company weighting, and the median. Common stock returns are from CRSP. Warrant returns are from Bloomberg and Refinitiv.

Panel A. Warrants

		One Year Returns			Three Year Returns		
Year	Number	Common	Warrants	Units	Common	Warrants	Units
2010	0	-	-	-	-	-	-
2011	0	-	-	-	-	-	-
2012	1	-53.2%	-7.1%	-49.8%	-98.1%	-98.6%	-98.2%
2013	4	-28.7%	81.3%	-17.6%	-43.7%	35.0%	-34.8%
2014	3	-46.5%	-38.3%	-47.1%	-94.6%	-91.1%	-94.7%
2015	6	-45.6%	-40.9%	-45.9%	-10.3%	68.6%	-5.5%
2016	8	1.4%	6.2%	1.6%	-28.8%	-16.6%	-28.6%
2017	11	-13.8%	2.2%	-12.8%	-37.5%	-29.2%	-36.9%
2018	22	-38.8%	-16.1%	-37.1%	-4.6%	43.2%	-0.5%
2019	25	2.0%	33.4%	2.6%	29.8%	215.7%	30.5%
2020	25	24.0%	265.2%	28.5%	10.5%	234.3%	15.7%
Total	**105**	**-8.8%**	**68.0%**	**-6.6%**	**-3.4%**	**113.6%**	**-0.3%**

Panel B. Different Weighting Methods

	One Year Returns	Three Year Returns
Equally Weighted	68.0%	113.6%
IPO Proceeds Weighted	55.1%	74.2%
Warrant Price at T=0 Weighted	25.6%	42.7%
Median	-8.7%	-21.8%

Table 8. Underwriter Prestige Ranks and SPAC and deSPAC Period Returns

Table 8 reports the relation between underwriter prestige ranks and both SPAC and deSPAC period returns. *UWRANK* is the lead (left) underwriters' reputation rank from Loughran and Ritter (2004), defined as the prestige rank on a 1 to 9 scale (9 for high prestige) following Carter and Manaster (1990). For the SPAC period returns, we use 210 SPAC IPOs between January 2010 and December 2019, following Table 4. For the deSPAC period returns, we use 114 completed business combinations between January 2010 and September 2020, following Table 5. When the full one-year or three-year data are not available, we calculate the returns based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 as both one-year and three-year returns. Each observation is equally weighted.

	SPAC Period	deSPAC Period Common Shares	
	Annualized Returns	One-Year Returns	Three-Year Returns
$UWRANK < 5$	8.7%	-27.7%	-45.7%
$5 \leq UWRANK < 8.5$	13.3%	-2.3%	34.9%
$8.5 \leq UWRANK$	21.6%	-0.7%	0.1%

Table 9. Potential Dilution per Unit and SPAC and deSPAC Period Returns

Table 9 reports the relation between potential dilution per unit and investor returns on units during the SPAC period and on common shares during the deSPAC period. We first calculate the fraction of a common share that derivative securities included in a unit can convert into. For example, if SPAC A's unit comes with one common share and a quarter of a warrant, and if one warrant can convert into one common share, we classify SPAC A as having a 1/4 dilution. If SPAC B's unit comes with one common share, one warrant, and one right, and if a warrant converts into a common share and a right converts to one-tenth of a common share, we classify SPAC B as having a 1.1 dilution. We report SPAC period and deSPAC period common share returns for low, middle, and high dilution groups based on this measure. For the SPAC period returns, we use 210 SPAC IPOs between January 2010 and December 2019, following Table 4. For the deSPAC period returns, we use 114 completed business combinations between January 2010 and September 2020, following Table 5. Each observation is equally weighted.

	SPAC Period	deSPAC period Common Shares	
	Annualized Returns	One-Year Returns	Three-Year Returns
$Dilution \leq 1/3$	23.7%	26.3%	40.3%
$1/3 < Dilution \leq 2/3$	14.1%	-14.2%	4.3%
$2/3 < Dilution$	13.5%	-23.4%	-33.1%

Table 10. Redemptions and Time between SPAC IPO and Business Combination and deSPAC Period Returns

Table 10 examines whether SPAC shareholder redemption decisions and the time between SPAC IPO and business combination completion predict deSPAC period returns. The sample consists of 114 business combinations completed between January 2010 and September 2020. It reports output from regressions having one-year and three-year deSPAC returns as the dependent variables. Returns and redemption ratios are measured in decimal format (e.g., a return of -30% and a redemption ratio of 90% are measured as -0.30 and 0.90). *Log(months)* refers to the natural logarithm of the number of months between the IPO date of a SPAC and its business combination date. Standard errors are reported in parentheses. Statistical significance levels: *** p-value$<$0.01, ** p-value$<$0.05, * p-value$<$0.10.

Dependent Variable	*One-Year deSPAC Common Returns*			*Three-Year deSPAC Common Returns*		
	(1)	(2)	(3)	(4)	(5)	(6)
Redemption Ratio	-0.572***		-0.464**	-0.442*		-0.426*
	(0.206)		(0.195)	(0.234)		(0.241)
Log(Months)		-0.503**	-0.307		-0.227	-0.0480
		(0.241)	(0.234)		(0.341)	(0.364)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N. Observations	114	114	114	114	114	114
Adj. R-Squared	0.101	0.070	0.110	0.040	0.026	0.031

Table 11. deSPAC Negotiations: Forfeitures, Inducements, New Capital, and Vesting Provisions

Table 11 examines some outcome characteristics of business combination negotiations. The sample consists of 153 business combinations completed as of March 2021 by the SPACs that went public since January 2015. **Panel A** reports the average redemptions and the frequencies of sponsors forfeiting their promotes, inclusions of vesting (earnout) provisions on sponsor promotes, underwriters surrendering their deferred commissions, inducements paid, and new capital involved in the merger. **Panel B** reports means and medians (in parentheses) on the magnitudes of the forfeitures, sponsor shares subject to vesting restrictions, inducements, and new capital. We report the statistics for the whole sample and the low- and high-redemption sub-samples based on the median redemption ratio of 22%.

Panel A. Frequency of Haircuts and Inducements

	Total Sample	Low Redemption	High Redemption
Average Redemption Ratio	37%	2%	73%
Percentage of deSPAC deals in which			
(1) Sponsors Forfeit Common Shares	53%	39%	66%
(2) Sponsors Forfeit Warrants	30%	21%	39%
(3) Sponsor Shares Have Vesting Provisions	27%	26%	27%
(4) Underwriters Forfeit Deferred Commissions	7%	4%	9%
(5) Provide Inducements	31%	24%	38%
(6) Have New Capital (e.g., PIPEs)	80%	86%	74%

Panel B. Magnitude of Haircuts and Inducements

	Total Sample	Low Redemption	High Redemption
(1) % of Sponsor Common Shares Forfeited	17% (3%)	9% (0%)	25% (23%)
(2) % of Sponsor Warrants Forfeited	19% (0%)	12% (0%)	26% (0%)
(3) % of Sponsor Shares Having Vesting Provisions	11% (0%)	13% (0%)	9% (0%)
(4) % of Underwriter Deferred Fees Forfeited	4% (0%)	2% (0%)	5% (0%)
Conditional on Non-Zero Forfeiture	53% (57%)	53% (59%)	53% (55%)
(5) Inducement Shares as % of Sponsor Shares	7% (0%)	4% (0%)	11% (0%)
Inducement Warrants as % of Sponsor Warrants	22% (0%)	16% (0%)	29% (0%)
(6) New Capital as % of Total Cash Delivered	41% (41%)	37% (39%)	46% (44%)
New Capital as % of SPAC IPO Proceeds	62% (40%)	84% (65%)	41% (23%)
(7) Cash Delivered per Share	\$7.48 (\$8.13)	\$8.59 (\$8.62)	\$6.38 (\$7.04)

Appendix

A1. The Life Cycle of SPACs based on Examples

The complicated structure of SPACs can be best understood with examples. We provide three cases – Social Capital Hedosophia, which merged with Virgin Galactic Holdings, as a successful SPAC, and Barington/Hilco Acquisition and Allegro Merger, two SPACs that announced business combinations but liquidated in the end, as examples of unsuccessful SPACs.

A1.1. Social Capital Hedosophia (currently Virgin Galactic)

Social Capital Hedosophia Holdings Corp. (SCH), which is now traded as Virgin Galactic, was launched as a partnership between two venture capital firms – Social Capital, which was founded by Chamath Palihapitiya, and Hedosophia, which was founded by Ian Osborne. SCH went public on September 14, 2017, offering 60 million units at the price of $10 per unit, raising $600 million (69 million units and $690 million, including the the full exercise of the underwriter over-allotment option). Credit Suisse was the sole underwriter. SCH set 24 months as a deadline to complete a business combination.

Each unit of SCH consists of one Class A common share, and one-third of one warrant, with each whole warrant allowing the purchase of one Class A common share at $11.50, conditional on the consummation of a business combination and exercisable within five years from the business combination date. Units were scheduled to be traded separately as common shares and warrants on the 52nd day following the IPO, but at the discretion of the underwriter (Credit Suisse), units became unbundled on September 29, 2017.

On July 9, 2019, about 22 months after its IPO, SCH announced a definitive agreement outlining a business combination with Virgin Galactic, Virgin Group's spaceflight company. However, SCH could not close the announced merger before its initial 24 months deadline, which was September 2019. SCH sought a three-month extension of a deadline, giving shareholders an option to redeem their shares if they do not agree with the proposed charter extension.

As a result, 3.7 million shares, which is 5.5% of the total shares, were redeemed at $10.37 per share. Upon the business combination, SCH gave shareholders another option to redeem their shares. This time, 12.1 million shares, or 17.5% of the total shares, were redeemed at $10.33. The deal was completed on October 25, 2019, set to start trading as a new entity 'Virgin Galactic Holdings Inc' on the next trading day, October 28, 2019 (Monday).

Sponsors, both Social Capital and Hedosophia, did not forfeit any founder shares or warrants. Instead, Chamath Palihapitiya, the founder of Social Capital and SCH, provided extra capital as a PIPE investor, investing $100 million by purchasing 10 million common shares at $10 per share. SCH also invited Boeing as a second PIPE investor, receiving a $20 million investment by issuing 1,924,402 common shares at a price of $10.40 per share.

Based on the optimal redemption strategy of purchasing units in the IPO and selling or redeeming common shares and derivative securities five trading days prior to the business combination (to avoid settlement complications or inducing a look-ahead bias), a SPAC investor who bought one unit of SCH, consisting of one common share and one-third of one warrant, on the IPO date at $10.00, would cash out at $11.23, earning a 5.72% of annualized return.

The stock price of Virgin Galactic peaked at $33.87 on February 17, 2020, just before the COVID-19 pandemic hit the market. It was traded at $18.29 on October 27, 2020, the last day of the one-year investment period. Based on our deSPAC period buy-and-hold investment returns, an investor who bought one share of Virgin Galactic at the first trading date price of $11.79 would have earned 55% for the first year, while the value-weighted CRSP return for the same period was 14%, resulting in a 41% abnormal return. For the same period, a warrant investor would have earned 140%.

A1.2. Barington/Hilco Acquisition and Allegro Merger (Both Liquidated)

Barington/Hilco Acquisition Corp (BHAC) went public on February 6, 2015, offering 4 million units at a price of $10 per unit, raising $40 million (4.29 million units and $42.9 million, including the partial exercise of the underwriter over-allotment option). EarlyBirdCapital was the lead bookrunner. BHAC set 18 months as an original deadline to consummate a business combination.

However, BHAC extended the charter six times total before it finally liquidated on October 31, 2018, almost 45 months after its IPO on February 6, 2015.

BHAC announced two unsuccessful definitive agreements during its life span. The first target was Oomba, an online social networking and tournament gaming platform, announced on May 16, 2017. However, on November 30, 2017, BHAC announced that it has terminated the definitive merger agreement it entered with Oomba, because *'Oomba breached several of its obligations under the Merger Agreement, including, but not limited to, its obligation to deliver to the Company audited financial statements'*.[33] About three months later, BHAC announced that it entered into a letter of intent with Specialty Brands Holdings. Specialty Brands would spinoff its Papa Gino's Pizzeria by merging it with BHAC on February 14, 2018. However, on April 25, 2018, BHAC announced the termination of the agreement because *'the proposed purchase price for the Company was not in its best interest or that of BHAC. . . . the parties were unable to agree upon a revised purchase price. . . '*.[34] BHAC eventually announced its liquidation on October 31, 2018.

Allegro Merger (Allegro) went public on July 3, 2018, offering 13 million units at the price of $10 per unit, raising $130 million (14.95 million units and $149.5 million, including the full exercise of the underwriter over-allotment option). Cantor Fitzgerald was the lead bookrunner. Allegro set 18 months as an original deadline to finish a business combination and extended it once before liquidating on March 31, 2020, about 21 months after its IPO on July 3, 2018.

Allegro announced a definitive agreement with TGI Fridays (TGIF) on November 8, 2019. The agreement included specific closing conditions such as requiring that Allegro would deliver at least $30 million in cash and assume TGIF's $350 million of net debt. However, as the COVID-19 pandemic hit the market, the deal was cancelled. On March 31, 2020, Allegro and TGIF mutually determined to terminate the deal because of *'extraordinary market conditions and the failure to meet necessary closing conditions, to terminate their previously announced merger agreement'*.[35] Allegro announced its liquidation from the same filing.

Although both BHAC and Allegro failed to complete business combinations and eventually liquidated, SPAC stage investors earned annualized returns of 3.06% and 1.82% from BHAC

[33] See https://www.sec.gov/Archives/edgar/data/1622175/000161577417007044/0001615774-17-007044-index.htm
[34] See https://www.sec.gov/Archives/edgar/data/1622175/000161577418002903/0001615774-18-002903-index.htm
[35] See https://www.sec.gov/Archives/edgar/data/1720025/000121390020008287/0001213900-20-008287-index.htm

and Allegro, respectively, based on our optimal redemption strategy. It is noteworthy that Allegro decided to liquidate in late March 2020 and returned the capital to its investors in early April 2020, when the US stock market suffered a significant drop from the COVID-19 pandemic. That is, even in the middle of the market crash, Allegro returned all the proceeds to investors with interest.

A1.3. The Evolution of the SPAC Structure: From the 'SPAC 1.0 & 2.0' to the 'SPAC 3.0'

Practitioners frequently refer to the period between 1993 and 1999 as 'SPAC 1.0', and the period between 2000 and 2009 as 'SPAC 2.0', and from 2010 as 'SPAC 3.0', in general.[36] Here, we summarize five key differences between SPACs that went public before 2010 (SPAC 1.0 and 2.0) and in 2010 or later (SPAC 3.0). Note that the below differences are based on the general trend – as each SPAC is entitled to decide its own structure, the comparison may not be true for some SPACs.

First, although there were 158 SPAC IPOs between 1997 and 2008, 72, or 46%, were traded in OTC markets.[37] From 2010, only 15 SPAC IPOs out of 393, or 4%, were traded in OTC markets, and since 2011, all have been traded on organized exchanges.[38] As the comparison of Table 3 and Table A1 demonstrates, SPACs that went public in 2008 or before tend to be significantly smaller than SPACs that went public in 2010 or later.

Second, in the SPAC 3.0 period, a typical underwriting commission consists of a 2% up-front fee and a 3.5% deferred fee payable only upon the completion of a business combination. However, it used to be the case that during the SPAC 1.0 and 2.0 periods, underwriter commissions were 7% (up to 10% during SPAC 1.0), and most of them were up-front.

Third, partly because of the large up-front underwriting fee, only about 85% of the IPO proceeds were deposited into the trust account prior to 2004, gradually increasing to high-90% by 2008 (See Jenkinson and Sousa (2011) and Lakicevic and Vulanovic (2013)). It is only after 2010 that 100% of SPAC IPO proceeds were deposited into the trust account. In recent years, some SPACs have deposited more than 100% of IPO proceeds in the trust account to attract the SPAC period investors.

[36] There are different versions of the classifications, such as referring to post 2015 as SPAC 3.5 or SPAC 3.0.
[37] The first SPAC IPO occurred in 1997 and the second in 2003. There was no SPAC IPO in 2009.
[38] Five SPAC IPOs in 2010 and ten in 2011.

Fourth, SPACs going public in 2010 and later are composed of units with fewer warrants, and the exercise prices are higher. That is, prior to 2010, the exercise price of warrants was at a 15% to 30% discount to the IPO price, but it changed to a 15% premium to the IPO price from 2010 (i.e., $11.50 for a SPAC IPO priced at $10). At the same time, SPACs that went public before 2010 provided warrants that can convert into 1 - 2 shares per unit, but a typical SPAC unit from 2010 provides warrants that can convert into 1/4 - 1 shares. We see a downward trend in recent years, especially in 2020 and 2021 (See Figure 3).

Fifth, before 2010, SPAC shareholders can either vote to approve a business combination or redeem their shares by rejecting the proposed business combination. In other words, shareholders could not approve a business combination and redeem their shares. From 2010, shareholders can make these two decisions separately, allowing them to approve a deal while still redeeming their shares. Accordingly, while Jenkinson and Sousa (2011) report that 26% (15 out of 58) of the SPACs that went public between August 2003 and June 2008 were liquidated, we find that only 15% (17 out of 114) of the SPACs that went public between January 2010 and May 2018 were liquidated.

A1.4. Current Status of SPACs

Panels A and B of Figure A1 report the current status of SPACs as of December 2020, based on the SPAC IPO years, dividing it into three categories – completed business combinations, liquidated, and seeking business combinations. For example, in 2017, a total of 34 SPACs went public, and 29 (85%) of them completed business combinations; 3 (9%) of them are liquidated; and 2 (6%) of them are still seeking business combinations as of December 2020. Two SPACs that went public in 2017 are still seeking business combinations as of December 2020 although the typical lifecycle of a SPAC is 24 months, because sponsors can ask shareholders for charter extensions. 10 out of 248 SPACs that went public in 2020 have completed a business combination as of December 2020.

A2. Additional Cross-Sectional Variations in deSPAC Returns

Table A2 summarizes returns based on different operational aspects of merging companies. Panel A shows that operating companies with a positive net income for the twelve months

before the business combination tend to perform better than companies with a negative net income. Also, companies that had sales of more than $100M produce higher returns than their smaller counterparts. This is consistent with a pattern found in traditional IPOs.[39] Panel B reports that biotech companies tend to perform better, while energy companies underperform, a pattern also documented by Renaissance Capital (2020). Panel C shows that foreign companies account for about 30% of deSPAC mergers, and they tend to underperform compared to domestic counterparts.

A3. State-Contingent Sponsor Compensation Renegotiations

It is not unusual for SPAC sponsors to have complicated state-contingent compensation structures. For example, the merger agreement between Acies Acquisition Corp ("ACAC") and PlayStudios (a mobile game developer), according to the SEC form 8-K filings, includes the following features.[40]

The sponsor will forfeit 403,594 Class B promote shares if more than 25% of public shares are redeemed, and an additional 403,594 shares will be forfeited if more than 50% are redeemed, with a proportional amount forfeited if between 25% and 50% are redeemed. Furthermore, the merger agreement also includes earnout provisions for sponsor promotes − 450,000 promote shares will be forfeited unless the post-merger stock price stays above $15.00 for a certain number of days, and another 450,000 promote shares will be forfeited unless the stock price stays above $12.50 for a certain number of days. In addition, the sellers (operating company shareholders) will be given 7,500,000 shares if the common stock price equals or exceeds $12.50 for a certain number of days at least 150 days after, but within 5 year of closing; and an extra 7,500,000 shares if the common stock price equals or exceeds $15.00 for a certain number of days for the same period. The additional common shares would offset the dilutive effects from SPAC warrants.

Therefore, the SPAC shareholders will be diluted if the post-merger operating company stock price goes up sufficiently, but the operating company and public SPAC shareholders will gain from the forfeiture (anti-dilutive) effect of sponsor shares being canceled if the stock price does

[39] See Table 16b from https://site.warrington.ufl.edu/ritter/files/IPO-Statistics.pdf
[40] See https://www.sec.gov/Archives/edgar/data/1823878/000110465921010465/0001104659-21-010465-index.htm

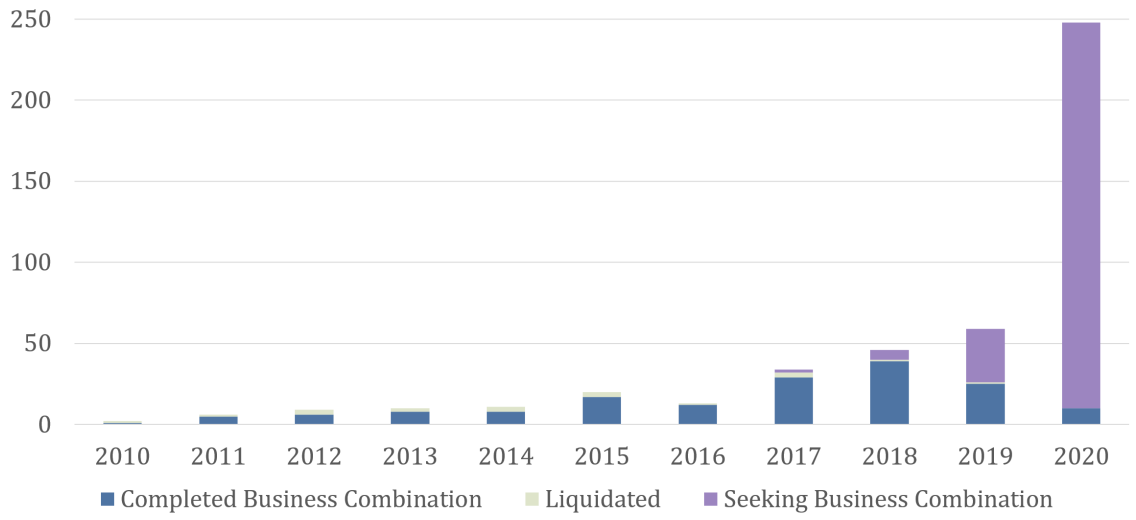
not go up. The merger agreement requires the SPAC to deliver $200 million in cash (ACAC had $215 million in trust), and values the common equity of PlayStudios at $1.041 billion. The $1.041 billion pre-money valuation is based on PlayStudios stockholders receiving 89.1 million shares of ACAC common stock and $150 million in cash. $250 million has been committed from PIPE investors at $10 per share. Essentially all shares of the sponsors and PlayStudios shareholders will be subject to a 12-month lockup.

Post-merger, there would be up to 21.525 million public shares, 89.1 million Playstudios shares, 5.3 million sponsor shares, and 25 million PIPE investor shares, for a total of about 141 million shares outstanding, plus about 26 million warrants that entitle each warrant holder to buy 1/3 share at $11.50. The common stock traded at $11.35, above the redemption price, following the merger announcement, which was greeted positively by shareholders. On a fully diluted basis, there would be 141 million + 8.7 million shares from potential warrant exercise + possibly 15 million shares from the earnout.

Figure A1. SPAC IPOs by Outcome

Panel A reports the outcome of each SPAC based on the year that a SPAC went public. A closed business combination means that a SPAC consummated a merger and started to trade as a newly merged company. Liquidated denotes that a SPAC could not complete a business combination and liquidated. Seeking business combination means that a SPAC is either still searching for a target company or is finalizing a proposed merger after announcing the target company. Y-axis represents the number of SPAC IPOs. **Panel B** shows the same numbers as a percentage for each year. SPAC IPOs do not include those traded in Over-The-Counter (OTC) markets.

Panel A. SPAC IPO Outcomes by Number (as of December 2020)



Panel B. SPAC IPO Outcomes by Percentage (as of December 2020)

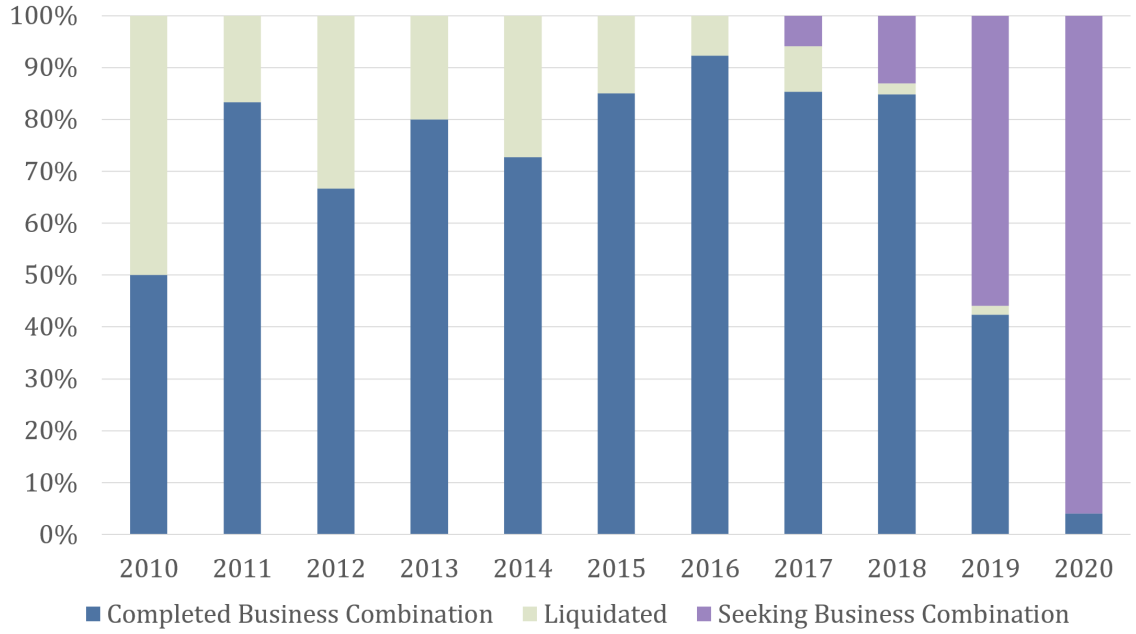


Table A1. SPAC IPOs prior to 2010

Table A1 reports the number of SPAC IPOs before 2010 with total and average proceeds. Among 158 SPACs that went public before 2010, 86 are listed on major stock exchanges (NYSE, NASDAQ, or AMEX) and 72 are traded in Over-The-Counter markets. Proceeds do not include underwriter over-allotment options and are reported in millions of dollars.

	Major Exchanges			OTC		
Year	No.	Total Proceeds	Avg. Proceeds	No.	Total Proceeds	Avg. Proceeds
1997	1	480	480	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	1	24	24
2004	-	-	-	12	426	35
2005	6	693	115	21	1,154	55
2006	17	2,236	132	18	777	43
2007	50	10,002	200	15	983	66
2008	12	3,475	290	5	152	30
2009	-	-	-	-	-	-
Total	**86**	**16,886**	**196**	**72**	**3,515**	**49**

Table A2. deSPAC Period Common Share Returns – Cross-sectional Patterns

Panel A reports equally weighted one year and three years deSPAC period common share returns based on profitability and sales. Profitability is measured based on net income for the last 12 months (LTM) prior to the business combination consummation date (or the previous fiscal year if the LTM net income is not available). Sales are measured based on the LTM revenue prior to the business combination consummation date (or the previous fiscal year if the LTM revenue is not available), reported in millions. SPAC, CRSP, and abnormal returns are the same as defined in Table 5. **Panel B** reports one-year and three-year deSPAC period common share returns based on industry. For tech and biotech companies, we follow Jay Ritter's SIC code based classification for his IPO data (See Ritter (2020)). For energy companies, we include gold, mines, coal, oil, and utility industries from the Fama-French 49 Industry Portfolio classification. **Panel C** reports one-year and three-year deSPAC period common share returns based on the operating country of merging companies. 34 out of 114 are based in foreign countries, and 15 are from China.

Panel A. Profitability and Sales

	One Year Returns			Three Year Returns		
	SPAC	CRSP	Diff.	SPAC	CRSP	Diff.
Total (114)	**-8.1%**	**16.5%**	**-24.7%**	**0.7%**	**41.1%**	**-40.4%**
Profitable (52)	**-3.4%**	**14.6%**	**-18.0%**	**13.8%**	**40.8%**	**-26.9%**
Sales > 100M (38)	-2.2%	13.5%	-15.8%	6.6%	42.7%	-36.0%
Sales < 100M (14)	-12.0%	17.6%	-29.6%	33.3%	35.6%	-2.2%
Not Profitable (62)	**-12.2%**	**18.1%**	**-30.3%**	**-10.3%**	**41.5%**	**-51.8%**
Sales > 100M (32)	-8.8%	14.2%	-23.0%	10.6%	41.8%	-31.2%
Sales < 100M (30)	-15.7%	22.3%	-38.0%	-32.6%	41.1%	-73.7%

Panel B. Industry

	One Year Returns			Three Year Returns		
	SPAC	CRSP	Diff.	SPAC	CRSP	Diff.
Tech (27)	2.5%	19.0%	-16.6%	-19.3%	42.4%	-61.7%
Biotech (6)	31.2%	20.5%	10.7%	44.9%	42.7%	2.2%
Energy (12)	-39.3%	15.0%	-54.3%	-54.9%	41.9%	-96.8%
Others (69)	-10.3%	15.5%	-25.8%	14.3%	40.4%	-26.1%
Total (114)	-8.1%	16.5%	-24.7%	0.7%	41.1%	-40.4%

Panel C. Country

	One Year Returns	Three Year Returns
USA (80)	-2.1%	1.5%
Foreign (34)	-22.3%	-1.3%
China (15)	-30.2%	7.7%
Total (114)	-8.1%	0.7%

Table A3. SPAC Mafia

This table reports the list of the largest holders of SPACs (the so-called "SPAC Mafia" members) based on the amount of capital invested in SPACs. AUM stands for "Asset Under Management". The data is from SPAC Research (https://www.spacresearch.com/) based on 13F filings on EDGAR at the end of September 2021.

Rank	Investor Name	SPAC AUM ($M)
1	Millennium Management	4,474
2	Mrshall Wace	4,375
3	Glazer Capital	4,097
4	Magnetar Financial	4,028
5	Citadel Advisors	4,017
6	Aristeia Capital	3,446
7	Periscope Capital	3,237
8	D. E. Shaw & Co.	2,672
9	Radcliffe Capital Management	2,578
10	Polar Asset Management Partners	2,479
11	Serengeti Asset Management	2,377
12	Weiss Asset Management	2,336
13	Sculptor Capital	2,303
14	Saba Capital Management	2,260
15	Linden Advisors	2,229
16	Hudson Bay Capital Management	2,153
17	Fir Tree Capital Management	2,050
18	Adage Capital Partners	1,962
19	UBS O'Connor	1,801
20	Shaolin Capital Management	1,677
	Total	**56,552**