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Why Take the Back Door?

Investigating the Performance of Reverse Takeovers in the United States

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ABSTRACT :

Going public marks a significant turning point in the growth of many companies. While academic literature has extensively examined traditional Initial Public Offerings (IPOs), alternative listing methods such as Reverse Takeovers (RTOs) have received considerably less attention. Limited prior research generally characterizes RTO firms as operationally weak, prone to information asymmetry, and vulnerable to scams, leading investors to avoid this route.

Despite this reputation, RTOs have gained popularity in recent years, particularly among smaller firms. This study aims to fundamentally assess the return performance of RTOs within a robust comparative framework. It addresses previous literature's criticism regarding the comparability of RTOs to traditional IPOs by including Private Investment in Public Equity (PIPE) financing and controlling for the comparable sample's size to match that of RTOs. This approach ensures that both RTOs and IPOs of similar size receive additional capital upon listing, placing them on more equal footing.

The study analyzes daily stock returns of listed U.S. companies from 2000 to 2023. Abnormal returns for RTOs are compared, both short- and long-term, to those of a comparable sample of Penny Stock IPOs (PSIPOs), relative to the Russell 2000 index. In addition to extending prior research on operational performance, the analysis includes a multivariate regression to examine how operational and qualitative factors influence returns.

The RTO sample is divided into shell companies and SPACs. The data is further split into two chronological periods to account for data availability and the enactment of the JOBS Act. Using the new comparative method, the results diverge from earlier findings, showing that RTOs outperform PSIPOs in the short term, as measured by CAR returns. Over the long term, PIPE-financed RTOs demonstrate the strongest performance. Their 12-month BHAR median return is 13.2%, compared to -41.2% for PSIPOs. A more detailed analysis reveals that these strong returns are concentrated among Shell RTOs, whereas SPACs underperform in line with previous findings.

The operational analysis supports earlier findings regarding the weak financial performance of RTOs, but it also shows that PSIPOs perform equally poorly. These results suggest behavioral irrationality and speculative tendencies among investors in RTOs, but simultaneously indicate that PIPE investor participation serves as a positive signal to retail investors. The findings offer a strong basis for further research in other regulatory jurisdictions, given that listing procedure regulations and typical financing models for RTO companies can vary significantly across regions.

KEYWORDS: RTO, PSIPO, PIPE, SPAC, SHELL

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TIIVISTELMÄ :

Listautuminen julkisen kaupankäynnin kohteeksi on merkittävä käännekohta monelle yhtiölle. Vaikka akateeminen kirjallisuus on laajasti tarkastellut perinteisiä IPO-listautumisia (Initial Public Offering), on vaihtoehtoisten listautumismenetelmien, kuten käännteisten listautumisten (RTO), tutkimus jäänyt vähemmälle huomiolle. Aiemmissä tutkimuksissa RTO-yhtiöt nähdään operatiivisesti heikkoina, informaatioepäsymmetrisinä ja petoksiin taipuvaisina, mikä on saanut monet karttamaan tätä listautumismuotoa.

Viime vuosina RTOt ovat kuitenkin yleistyneet etenkin pienempien yritysten keskuudessa. Tämän tutkimuksen tavoitteena on arvioida RTO:iden tuottokehitystä vertailukelpoisessa viitekehityksessä. Samalla vastataan aiemman kirjallisuuden kritiikkiin RTO:iden ja IPO:iden vertailtavuudesta sisällyttämällä tarkasteluun yleisesti järjestelyissä käytetty PIPE-rahoitus (Private Investment in Public Equity) ja kontrolloimalla vertailuotoksen yhtiöiden koot vastaamaan RTO:iden kokoluokkaa. Tämä lähestymistapa varmistaa, että sekä RTO:t että samankokoiset IPO:t saavat lisäpääomaa listautuessaan, asettaen ne tasavertaisempaan asemaan.

Tutkimuksessa hyödynnetään yhdysvaltalaisen yhtiöiden päivätuottoja vuosilta 2000–2023. RTO-yhtiöiden osakekurssien ylituottoja verrataan sekä lyhyellä että pitkällä aikavälillä vertailukelpoisen Penny Stock IPO (PSIPO) -otoksen ylituottoihin Russell 2000 -indeksistä. Tämän vertailukelpoisen menetelmän avulla täydennetään myös aiemman kirjallisuuden tuloksia operatiivisen suoriutumisen näkökulmasta sekä analysoidaan monimuuttujaregressiolla, miten tutkimuksen keskeiset operatiiviset ja laadulliset tekijät vaikuttavat tuottokehitykseen.

Osakekurssien performanssianalyysi on jaettu RTO:iden osalta kahteen keskeisempään kategoriaan eli shell- ja SPAC-yhtiöihin. Lisäksi aineisto on jaettu ajallisesti kahteen osaan, koska tutkimuksessa havaittiin mahdollinen riski siitä, että näillä voi olla eroja sekä datan saatavuuden että JOBS-lain voimaantulon takia. Uuden vertailukelpoisen menetelmän johdosta tutkimuksen tulokset poikkeavat aiemmasta kirjallisuudesta ja osoittavat, että RTOt tuottavat lyhyellä aikavälillä paremmin kuin PSIPOT CAR-tuotoilla mitattuna. Pitkän aikavälin tarkastelussa erityisesti PIPE-rahoitetut RTO:t osoittavat vahvinta kehitystä. Niiden 12 kuukauden BHAR-tuottojen mediaani on 13,2 %, kun PSIPOilla se on -41,2 %. Tarkempi analyysi paljastaa, että vahvat tuotot keskittyvät erityisesti shell-RTO:ihin, kun taas SPACit alisuoriutuvat aiempien tutkimusten mukaisesti.

Operatiiviset havainnot tukevat aiemman kirjallisuuden tuloksia RTO:iden heikosta taloudellisesta suoriutumisesta, mutta osoittaa, että vertailuryhmän PSIPOT suoriutuvat yhtä huonosti. Tulokset tukevat sijoittajien käyttäytymisteoreettista epärationaalisuutta ja spekulointia sijoittaessaan RTO-yhtiöihin, mutta samalla vahvistaa sitä, että PIPE-sijoittajien osallistuminen näihin luovat positiivisen signaalin yksityissijoittajille. Tulokset tarjoavat pohjan jatkotutkimukselle muilla sääntelyalueilla, sillä listautumismenettelyiden säännökset ja RTO-yhtiöiden tyypilliset rahoitusmallit voivat vaihdella merkittävästi alueittain.

AVAINSANAT: RTO, PSIPO, PIPE, SPAC, SHELL

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Abbreviations

BHAR	Buy-and-Hold Abnormal Return
BHR	Buy-and-Hold Return
CAR	Cumulative Abnormal Return
LOI	Letter of Intent
OLS	Ordinary Least Squares
OTCBB	Over-the-Counter Bulletin Board
PIPE	Private Investment in Public Equity
PE	Private Equity
PSIPO	Penny Stock Initial Public Offering
ROA	Return on Assets
ROE	Return on Equity
RTO	Reverse Takeover
SEC	Securities and Exchange Commission
SEO	Seasoned Equity Offering
Shell	Non-operating, publicly listed company
SPAC	Special Purpose Acquisition Company
VC	Venture Capital

1 Introduction

Going public is one of the most critical decisions for many private companies throughout their lifecycle. The traditional route is an initial public offering (IPO), where shares are offered to public investors for the first time. IPOs grant companies access to cost-effective capital, improve liquidity, enhance visibility, and attract a broader investor base. As such, IPOs have been extensively researched both academically and professionally (Augusto Arellano-Ostoa & Brusco, 2002; Dasilas et al., 2016; Gleason et al., 2005).

However, several studies have challenged the IPO's appeal, arguing that the process can be costly and time-consuming due to strict listing requirements (Brown et al., 2010; Dasilas et al., 2016; Song et al., 2014). In response, some firms pursue alternative paths to public markets, such as roll-ups, reverse leveraged buyouts, sellouts, and reverse takeovers (RTOs) (Dasilas et al., 2016). The use of these alternative listing methods has increased significantly in recent decades, with RTOs emerging as the most common approach.

A reverse takeover (also called reverse merger, RM) is a transaction in which a private company acquires a publicly listed shell to obtain public status. In practice, the listed company is the target, and the private company is the initiator of the arrangement, ultimately taking control of the new entity (Adjei et al., 2007; Song et al., 2014). This process often results in major structural changes, such as a shift in business focus, new leadership, and rebranding (Brown et al., 2010). In this sense, RTOs can be viewed as a form of "recycling" within capital markets.

Despite their growing popularity, RTOs have received limited academic attention. This is partly because they have only recently been systematically categorized in financial databases, reducing the need for manual data collection. Moreover, existing research is methodologically fragmented, producing mixed empirical results.

A common shortcoming in prior studies is the comparison of RTOs and IPOs without accounting for a crucial difference between them, namely that IPOs involve capital raising, which alters ownership structure and strengthens the equity base, whereas typical RTOs do not. This study addresses that gap by focusing on RTOs that raise capital through private investment in public equity (PIPE) (this method is sometimes referred as an alternative public offering, APO), enabling a more valid comparison with IPOs.

By analyzing the short- and long-term stock performance of RTOs and IPOs in the United States (U.S.), this study offers practical insights for corporate decision-makers on whether RTOs achieve performance levels comparable to IPOs, or if their negative reputation continues to impact their attractiveness to investors. Additionally, the study supports its findings with changes in operational performance, aiming to provide investors with an understanding of the average financial performance of these listing models. This helps retail investors understand potential speculative differences and information asymmetry between stock prices and financial performance.

1.1 Purpose of the study

This thesis aims to compare the short- and long-term performance of RTOs and IPOs in the U.S. market, contributing to the limited existing literature on this topic. As prior research is fragmented and often based on varying methodologies, this study seeks to be the most comprehensive and up to date in its field by utilizing a sample covering the entire 21st century. Additionally, it introduces novel comparative methods expected to enhance comparability and refine previous research approaches.

The study directly addresses Sjostrom's (2008) concerns regarding the weak comparability of IPOs and RTOs in previous research. In his study, Sjostrom highlights that, unlike RTOs, IPOs raise new capital at the time of listing, making direct comparisons challenging. Accounting for this distinction is crucial for accurately assessing both operational and stock price performance. Unlike prior studies, this research separately analyzes RTOs

that raise capital through the most common method available, PIPE. This approach ensures a more homogeneous sample, as firms raising new capital are expected to be in a similar growth phase compared to those listing without need for additional funds.

Another issue raised by Sjostrom (2008) concerns the limited liquidity of RTO-listed shares and their frequent trading on the Pink Sheets or OTC Bulletin Board. Floros and Shastri (2009) support this observation, noting that RTO firms are often significantly smaller than traditional IPOs. Following their approach, this thesis uses penny stock IPOs (PSIPOs) as a benchmark for comparison, as they share more characteristics with RTOs than conventional IPOs. These two methodological adjustments minimize structural differences between listing methods and challenge the notion that RTOs provide a cheaper route to public markets. When considering the costs, time and regulatory burden associated with PIPE financing, RTOs increasingly resemble PSIPOs.

Bradley et al. (2006) demonstrate that PSIPOs are particularly vulnerable to market manipulation and fraud, primarily due to limited reporting requirements, less reputable underwriters, low institutional ownership, and minimal analyst coverage. As a result, adjusting for the size factor of the comparison group can reduce or eliminate the difference in information asymmetry between these listing methods. This change is expected to diminish differences in short-term market reactions, depending on the extent to which the market accounts for firm size and information asymmetry. Therefore, this study hypothesizes that the market reaction to RTO announcements is similar to that of PSIPOs. This leads to the first hypothesis:

H1: The short-term stock price performance of RTOs will be similar to that of PSIPOs.

Building on the short-term market reaction hypothesis, this study further investigates whether the performance persists over longer time periods. Previous research has shown that the long-term performance of RTOs often turns negative (Song et al., 2014; Carpentier et al., 2012; Floros and Sapp, 2011; Dasilas et al., 2016). However, it remains

unclear whether this phenomenon stems from the inherent characteristics of RTOs or if similar patterns are observed among other small publicly listed firms. To address this, long-term abnormal returns are analyzed, with the expectation that the long-term stock performance of RTOs and PSIPOs will resemble each other. This leads to the second hypothesis, which assesses post-transaction stock performance over a 1- to 24-month period:

H2: The long-term stock price performance of RTOs will be similar to that of PSIPOs.

Building on the arguments of Sjoström (2008), it can be assumed that RTO firms raising PIPE financing exhibit different return patterns compared to those that do not. Floros and Shastri (2009) further discuss that the involvement of a PIPE investor may enhance the attractiveness of the firm to other investors. Additionally, securing financing should also support the company operationally by enabling growth and helping stabilize its financial position. If raising capital impacts investors' perceptions of a company's capabilities, it should positively influence the short-term market reaction after listing. Furthermore, if the new capital improves the operational situation and can be invested in projects with a positive net present value, this should also positively affect long-term stock price performance. Based on this reasoning, the third hypothesis is formulated as follows:

H3: RTO firms that raise PIPE financing generate superior returns both in the short and long term compared to firms that do not raise PIPE.

According to traditional financial theory, stock performance reflects expectations of future cash flows, which are influenced by financial and operational fundamentals. Prior studies (e.g., Pernamasari et al., 2020; Nugraha & Riyadhi, 2019) emphasize the importance of financial indicators, though others (Herawati & Angger, 2018; Edmans, 2011; Luo & Bhattacharya, 2006) highlight that intangible factors such as employee satisfaction or corporate social responsibility (CSR) also play a role. However, since this study focuses

on post-listing firm performance rather than corporate identity changes, it assumes CSR and intangibles remain relatively stable.

If the behavioral over-optimism associated with RTOs, as proposed by Carpentier et al. (2012), does not significantly influence short-term pricing, then investor valuations are likely driven by the firms' underlying operational quality. Under ceteris paribus conditions, such fundamentals should also support sustained long-term returns. It is therefore essential to evaluate the actual quality and development trajectory of the listing firms.

Since the study expects RTO and PSIPO stock price performance to align over the long term, their operational performance is also expected to follow a similar path. In this study, operational performance is measured in terms of profitability using the Return on Assets (ROA) metric, growth using Sales to Assets, leverage using Debt to Assets, investment in growth using Capex to Total Assets, and liquidity using several different liquidity measures. The fourth hypothesis is:

H4: The operational performance of RTOs will align with that of PSIPOs over a 1 to 2 years after the listing.

The findings of this study will provide valuable insights for private firm executives, private equity (PE) firms, and institutional investors. Private firm executives are afforded the opportunity to assess the viability of RTOs as an alternative listing mechanism. Concurrently, both individual and institutional investors may perceive publicly listed shell companies, poised for merger with a private entity, as a prospective investment opportunity. Furthermore, PE funds can achieve a better understanding of the distinctions between IPOs and RTOs when formulating their exit strategies.

1.2 Structure of the study

The remainder of this thesis is structured as follows. Chapter 2 introduces the theoretical framework by discussing the key concepts and underlying theories related to IPOs and

RTOs. Chapter 3 presents a comprehensive literature review, summarizing existing studies and main findings, and at the end, connects the thesis' hypotheses to prior literature. Chapter 4 describes the research methods, data sources, and formulas. Chapter 5 reports the empirical results and discusses their implications in the context of prior research. Finally, Chapter 6 concludes the thesis by summarizing the key findings, addressing limitations, and proposing directions for future research.

2 Mechanisms for obtaining a stock exchange listing

Deciding how to go public is not straightforward. While IPOs are the well-known path, the market offers several other ways to get listed on a stock exchange. These include roll-ups¹, reverse leveraged buyouts², direct public offerings³, outright sellouts⁴, and reverse takeovers, which are at the core of this research. This method differs from others in how control remains with the private company following the transaction (Song et al., 2014).

Unlike IPOs and RTOs, companies undertaking reverse leveraged buyouts have prior experience as publicly traded entities, whereas in sellouts, the acquiring company's performance and characteristics play a decisive role. On the other hand, direct public offering resembles a traditional RTO in that no capital is raised during the listing process, as it allows a company to list shares directly on an exchange without intermediaries⁵. However, the company's management sells their own shares to the public without issuing new shares, thus avoiding underwriting fees and share dilution. Understanding the differences between these methods, this study is limited to examining RTOs and IPOs for the sake of comparability.

When evaluating the performance of these two methods, it is beneficial to understand the underlying reasons why a company initially seeks to go public. This understanding provides insight into the objectives of potential post-listing actions and their subsequent

¹ In a roll-up, an investor, often a private equity firm, merges smaller companies to create a larger one that benefits from economies of scale. This combined company might then be sold or listed on an exchange (Servaes et al., 2000).

² Reverse leveraged buyouts involve taking a company that was previously made private through a leveraged buyout and then relisting it, often with a later-stage private equity investor involved (Cao & Lerner, 2009).

³ A DPO allows a small private company to go public by directly selling registered shares to investors (Sinha et al., 2005).

⁴ In a sellout, a publicly listed company acquires a privately owned firm while retaining control over the combined entity (Song et al., 2014).

⁵ This in-house-managed method is typically chosen by smaller companies aiming to minimize costs and retain greater control over their ownership structure. Direct public offerings can be completed in approximately seven to nine months, in contrast to traditional underwritten IPOs, which usually take between six months and a year and a half and are significantly more expensive (Sinha et al., 2005).

impact. If a company's management perceives that the value-creating drivers of going public outweigh its potential challenges, the listing can generate positive stock price performance. Momtaz (2022) synthesizes findings from previous literature on common motivations, which include overcoming financing constraints, reducing information asymmetry, diversifying ownership, using shares as currency in future acquisitions, facilitating insider sales, and capitalizing on potentially overvalued markets.

This section traces the processes by which companies transition to public via IPOs and RTOs, while also dissecting the theoretical rationales that inform both methodologies. It also introduces PIPE, a typical financing structure frequently used in RTOs, through which these companies raise capital immediately after listing. The section aims to highlight the key structural differences between IPOs and RTOs, setting the stage for analyzing RTO performance in the empirical part of this study.

2.1 Initial public offering

Before proceeding with a detailed examination of RTOs, this paper first focus on the more common approach to go public, the IPO. It is important to look into this because they constituted up to 87% of all combined IPOs and RTOs between 1995 and 2012 (Appadu et al., 2014). However, this proportion exhibits a significant dependency on economic cycles. For instance, during the financial crisis, IPO volume dropped by 97%, while the corresponding change in RTO activity was markedly subdued⁶. Overall, the U.S has averaged more than one IPO per business day during the period of 1980–2001 (Ritter & Welch, 2002). This average has remained largely consistent in subsequent review periods.

The IPO process differs from backdoor listings in several key aspects, as IPOs involve the company going public to raise new capital or to allow existing owners to sell their shares. Unlike an RTO, there is no need to identify a shell company through which to gain a stock

⁶ This pattern is also evident during the earlier dot-com bubble of 2000–2001.

exchange listing. Instead, the first step is often to select an investment bank (lead underwriter) to advise and perform the underwriting functions for the issue. This decision is often driven by the bank's reputation and its industry-specific research coverage⁷, as noted by Corwin & Schultz (2005). This is crucial because the listing company must be attractive enough for the underwriter to agree to purchase the shares, knowing they should be resold later. This initial step reduces information asymmetry and enhances the attractiveness of IPOs compared to alternative listing methods.

The lead underwriter plays a central role in an underwritten IPO, coordinating everything from due diligence to share distribution, with a primary responsibility of managing the registration statement⁸. The lead underwriter often assembles a syndicate of other banks to share the underwriting risk and expand the investor network, with each syndicate member receiving a portion of the gross spread⁹(Ellis et al., 1999). They collaborate with the issuer's team and advisors to ensure accurate public disclosure. They also draft the letter of intent (LOI), outlining key terms like underwriting fees¹⁰ and the overallotment option for potentially issuing more shares if demand is strong (Chen & Ritter, 1998).

The final stages of the IPO process involve marketing efforts, including the preparation of a preliminary prospectus or the "Red Herring" and roadshows to generate investor interest. After the SEC (Securities and Exchange Commission) signs off on the registration statement, the final price and number of shares are set during the pricing meeting. Once the underwriting agreement is signed, trading begins, and the underwriter supports the stock after it goes public through stabilization efforts and analyst coverage. The company then enters a 25-day quiet period, mandated by the SEC, which signals its transition to a publicly traded entity and allows for public discussion of its valuation and earnings forecasts (Ellis et al., 1999).

⁷ The type of investors a company is aiming for, whether big institutions or individual traders, also matters, as some banks focus on serving one group more than the other (Ellis et al., 1999).

⁸ A registration statement is a document mandated by the Securities Act of 1933. It includes a prospectus for potential investors and provides detailed information for the SEC.

⁹ Gross spread is the difference between the purchase price and the public offering price.

¹⁰ Underwriting fees are around 7 percent of proceeds.

The IPO process outlined above is often lengthy and demanding, requiring significant expertise, time, and capital. The objective is to optimally determine the initial offering price and size, handle all legal matters related to the offering, and prepare all the required documentation for the due diligence. Due to its complexity, the process is vulnerable to economic uncertainty, as it typically depends on successful share sales. The following subsection delves deeper into existing literature on theories explaining varying IPO activity, the key IPO cost of underpricing, and long-term performance.

2.1.1 IPO activity theories

Research on IPOs has led to the development of multiple theoretical perspectives that explain the motivations and timing behind a firm's decision to go public. While these theories have emerged specifically from the IPO literature, they address the general benefits of going public and are thus applicable to the RTOs examined in this paper. The theories are classified into three main categories: life cycle theories, valuation theories, and market-timing theories. Each of these frameworks provides insights into the factors influencing IPO activity, ranging from firm-specific growth considerations to external market conditions.

Firstly, life cycle theories suggest that entrepreneurs are motivated by various factors such as securing a higher valuation for future acquisitions or raising capital for expansion. Zingales (1995) pioneered the investigation into the public listing decision, revealing that publicly listed firms are more visible to potential buyers, thereby increasing the likelihood of acquisition. Moreover, by going public, the original owners can minimize bargaining challenges with potential buyers, leading to higher acquisition valuations for their firms.

Secondly, valuation theories emphasize the role of external factors in enhancing a firm's value post-IPO. Holmström and Tirole (1993), argue that going public subjects a company

to continuous monitoring by external entities such as investment banks, auditors, analysts, investors, and regulatory bodies like the SEC. This enhanced oversight not only strengthens investor confidence but also contributes to an overall increase in firm value.

A key component of valuation theories is the liquidity effect of an IPO. Pástor and Stambaugh (2003) highlight that listing on a stock exchange enhances the tradability of a firm's shares, thereby reducing liquidity constraints for investors. This improved liquidity often translates into a valuation premium, as investors are generally willing to pay more for shares that can be easily bought and sold.

Additionally, stock prices serve as valuable sources of information for both investors and firm management. Subrahmanyam and Titman (1999) introduce the concept of "information spillovers," where a firm's stock price reflects market expectations and potential growth opportunities ahead. These price signals can influence managerial decisions, providing firms with insights that guide future investment and expansion strategies.

Thirdly, market-timing theories suggest that companies strategically time their IPOs to coincide with favorable market conditions. The core idea is that firms capitalize on periods of high valuations and investor optimism by issuing equity when prices are high, and conversely, repurchasing shares when prices are low. Following this, Lucas & McDonald (1990) introduced an information-theoretic model predicting that equity offerings typically occur following abnormal positive returns in both the issuing firm's stock and the broader equity markets. Conversely, during bear markets, entrepreneurs tend to delay IPOs until more favorable market conditions arise. This explains why Appadu et al. (2014) find the volatility of IPO volume to be significantly greater than that of RTOs.

Building on this theory, Bayless and Chaplinsky (1996) introduce the concept of "windows of opportunity," where firms identify periods of strong investor demand and elevated market valuations to maximize capital raised through an IPO. Similarly, Choe et al.

(1993) suggest that firms are more likely to issue equity when other high-quality companies are doing the same, as this reduces adverse selection risks and enhances investor confidence in the overall market. They argue that during these periods, the adverse selection risks are lower compared to bear market conditions, as the presence of high-quality equity issues reduces the uncertainty surrounding equity values for firms planning to go public. This reduction in uncertainty makes public financing a more appealing option for entrepreneurs.

2.1.2 IPO underpricing

It is widely recognized, that in the short term, investors often realize gains due to IPO underpricing¹¹, which represents a significant indirect cost for the company going public. This means that shares are listed on the market at a price substantially below the prevailing price on the immediate aftermarket (Ibbotson, 1975; Ritter, 1984; Loughran and Ritter, 2004; Purnanandam & Swaminathan, 2004; Ljungqvist, 2007; Agathee et al., 2012).

Looking at prior research, Westerholm (2006) finds Nordic IPOs experienced an average underpricing level of around 17%. This aligns with Ljungqvist's (2007) work on U.S. IPOs, which records about 19% average underpricing, and Ibbotson's (1975) finding of 11.4% underpricing for IPOs from 1960 to 1970. Loughran and Ritter (2004) further observed that underpricing varies significantly with the market environment, noting 7.3% underpricing during the 1980s, 15% from 1990 to 1998, and 65% during the Dot-com bubble (1999–2000). These findings serve as the benchmark for the first hypotheses of this study.

Several factors influence the extent of underpricing. Higher uncertainty, often associated with younger companies (Ritter, 1984; Beatty & Ritter, 1986) or smaller, riskier IPOs (Beatty & Ritter, 1986), tends to lead to greater underpricing. Conversely, companies with stronger operational performance typically experience less underpricing (Michaely & Shaw, 1994). These are significant findings for this study, as Konku et al. (2012) show

¹¹ Calculated as the difference between closing price and initial offering price, divided by the initial price.

that PSIPO companies are mainly small in size and financially weak, which would indicate high underpricing for them.

Other studies also show that the timing of the IPO and the level of risk inherent in the company's industry significantly influence the determination of the initial price (Loughran & Ritter, 2004; Ritter, 1991). The reputation of the investment bank underwriting the IPO can also affect the perceived risk and ultimately the degree of underpricing, as a better underwriter signals positively to the public, building confidence in the offering. However, findings on this aspect are not entirely consistent across studies (Michaely & Shaw, 1994; Ljungqvist et al., 2006).

In addition to the above observations, academic literature has developed numerous theories to explain the IPO underpricing phenomenon, which can be divided into information asymmetry-based underpricing and theories related to market conditions and investor behavior. These theories are pivotal when comparing the short-term return potential of RTOs and IPOs. The following subsections delve deeper into these theories.

2.1.2.1 Information Asymmetry Theories

One of the most well-known theories explaining IPO underpricing is the winner's curse hypothesis, introduced by Rock (1986) and Beatty & Ritter (1986). This hypothesis suggests that due to asymmetrical information among investors, some may end up overpaying for newly issued shares. Specifically, informed investors can identify overpriced IPOs and avoid them, leaving less informed or uninformed investors to purchase potentially overvalued shares. Consequently, investors who submit the highest bids win the auction but are "cursed" by overpaying, having overestimated the fair value of the shares.

According to Rock (1986), the theory is backed by the assumption that informed investors would only select underpriced issues, while uninformed investors would invest in all issues on average, resulting in fewer underpriced IPO stocks. This may lead to negative earnings for uninformed investors and hence discourage them from trading. To make the

IPO appealing to these less informed investors and compensate them for the higher risk they face, companies intentionally set the IPO price lower than its intrinsic value. This underpricing helps ensure that all investors are willing to participate in the IPO, despite the information disadvantage.

Only three years later, Benveniste and Spindt (1989) introduced the market feedback hypothesis alongside the winner's curse hypothesis. This theory explains IPO underpricing as a result of the interaction between the issuing firm and informed investors. According to this hypothesis, underwriters collect valuable information from a select group of informed investors during the book-building process. These investors, who possess insights not readily available to the issuer, are incentivized to share their information by receiving a larger allocation of underpriced shares. Underpricing thus serves as a mechanism to align the incentives of informed investors, encouraging them to reveal their true demand. This process, known as "sounding," enables underwriters to refine the offer price more accurately based on market feedback.

Later empirical evidence supports Benveniste and Spindt's (1989) theory. For example, Hanley (1993) finds that IPOs tend to experience higher initial returns when the final offer price is adjusted upward from the initial pricing range. This phenomenon, known as "partial adjustment," suggests that investor information is not fully incorporated into the initial pricing, further highlighting the role of underpricing in eliciting honest feedback during the book-building process.

Allen and Faulhaber (1989) and Welch (1989) provides a tactical view on why IPOs are often underpriced. Their signalling hypothesis assumes that companies deliberately underprice their initial public offerings to signal their quality to the market. The core belief is that high-quality companies are confident about their future and are willing to take a short-term hit by underpricing to show this confidence to potential investors. By underpricing the IPO, these firms send a strong signal that they expect the stock price to in-

crease significantly in the aftermarket, reflecting their high quality and future profitability. This theory contradicts the findings of Michaely & Shaw (1994) regarding the negative correlation between underpricing and operating performance.

According to the signalling hypothesis, underpricing serves as a credible commitment mechanism. Since only firms with solid fundamentals can afford to forego higher immediate capital inflow, underpricing differentiates high-quality firms from lower-quality ones, which might not have the same confidence in their future performance. The market interprets the underpricing as a sign of quality, leading to greater investor trust and higher long-term valuation. Moreover, the signalling hypothesis suggests that firms anticipate recovering the costs of underpricing through future financing rounds or follow-on offerings at more favourable terms, benefiting from the reputation and investor confidence established during the IPO process (Welch, 1989). This perspective aligns with Ibbotson (1975), who argues that underpricing leaves a "good taste in the investor's mouth," ultimately increasing the firm's ability to issue additional securities on attractive terms in the future.

Lastly, the market incompleteness hypothesis, as explained by Mauer and Senbet (1992), provides a framework for understanding IPO underpricing through financial market inefficiencies. They suggest that underpricing happens because IPOs are first traded in the primary market, which has limited access and fewer comparable firms, before moving to the larger secondary market. The lack of perfect substitutes for newly issued IPOs in the primary market creates a temporary price gap.

Mauer and Senbet (1992), presents that the underpricing in the primary market helps attract investors by compensating for the risks of limited access and uncertainty about the firm's value. As the IPO enters the secondary market, more investors gain access, and comparable assets become available, which reduces the underpricing over time. This phenomenon, known as the "seasoning effect," leads to a gradual narrowing of the price gap as the market becomes more efficient and incorporates new information.

These information asymmetry theories are central to the first hypothesis of this study, as many companies with significant information asymmetry choose to go public through an RTO instead of an IPO to avoid substantial underpricing at the time of listing (Floros & Shastri, 2009). Investors recognize that RTO managers have opted to bypass the traditional IPO certification process, increasing the cost of equity for the newly listed company (Carpentier et al., 2012; Bayar et al., 2021). Consequently, in the absence of third-party certification, investors expect concrete positive news from the company to bridge the information gap.

2.1.2.2 Market Conditions & Behavioral Theories

IPO markets tend to follow a cyclical pattern. Periods where new stocks see high initial gains, often called "hot markets," are usually followed by times with lower returns (Ibbotson and Jaffe, 1975). They define hot issue markets as periods characterized by unusually high first-month average returns on new issues. The authors find that first-month residuals do not behave randomly but are instead predictable, which can help investors identify months with potentially higher returns. This market condition influences IPO activity and helps issuers set their offering prices. During hot markets, initial pricing is typically lower, leading to higher closing prices on the first day of trading. As a result, hot markets see increased IPO activity and increased underpricing.

Hot market theory is supported by Ritter (1984), who documented three to four periods from 1960 to 1982 when average monthly initial returns are very high over a long period. Each of these periods is followed by a significant and sustained increase in the volume of IPOs. The author examined the six-year period from 1977 to 1982, including hot and cold market periods, and found that the average first-day return in the hot issue market is 48.8% compared to only 16.3% in the colder period.

Later, Bikhchandani et al. (1992) offers a different perspective on the phenomenon of IPO underpricing. Their research shows several situations in which group behaviour influences the decisions made by individuals, IPO being one of them. This bandwagon hypothesis suggests that the behaviour of early investors can significantly influence the decisions of later investors, creating a bandwagon or cascade effect.

Welch (1992) backs up this hypothesis, showing that strong early interest in an IPO sends a positive signal to the market¹², suggesting that the offering is a worthwhile investment. This perception encourages additional investors to participate, often disregarding their own private information in favour of following the crowd. To generate initial demand and create momentum, companies deliberately underprice their IPOs, making shares more attractive to early investors. This underpricing not only rewards the first investors but also helps to build a sense of desirability around the offering. As more investors jump on the bandwagon, demand for the IPO increases, leading to broader market participation.

The behavioural impact of the bandwagon hypothesis is also evident in investor interest toward RTOs. Floros and Shastri (2009) demonstrate that securing a sophisticated PIPE investor for an RTO, signals that the listing is attractive to an established investor. This, in turn, encourages retail investors to participate, increasing demand for the newly listed company's shares.

2.1.3 Theories behind long run performance

As discussed in the first chapter, this study also examines long-term performance, where the operational measures of the newly listed company become a significant factor of post-listing performance. Academic literature has well established that, on average, IPOs are poor long-term investments, significantly underperforming over a three to five-year horizon (Ritter, 1991; Levis, 1993, Chen et al. 2013). These findings are supported by

¹² Conversely, weak demand from early investors may be interpreted as a negative signal, leading later investors to withdraw or avoid the IPO altogether.

evidence of weak post-IPO operational performance, first reported by Jain & Kini (1994) in their study focusing on the U.S. market. There are three mainstream theories in academic literature to explain the weak long-term performance of IPOs.

The first theory is agency theory, which, based on the research of Jensen and Meckling (1976), posits that the separation of ownership and control in publicly traded companies leads to conflicts of interest between managers and shareholders. Prior to an IPO, firm management is often heavily invested in the company through their ownership, aligning their interests with those of other shareholders. However, during or after the IPO, management's ownership stake may be diluted through dilution or share sales, reducing their direct financial stake in the company's success. This shift can lead to agency problems where managers prioritize personal benefits, such as increased compensation, perquisite consumption, or empire-building, over shareholder value maximization. Jain and Kini (1994) provide empirical evidence that firms experience a decline in post-IPO operating performance due to weakened managerial incentives.

Secondly, Shiller (1990) introduces the impresario hypothesis (also known as the fads hypothesis), which argues that IPO underwriters prioritize attracting a large number of investors over maximizing the initial per-share profit. By intentionally underpricing shares, investment bankers create a surge in demand, generating excitement among investors. This heightened enthusiasm leads to strong early returns, attracting a broad base of investors, often driven by sentiment and the fear of missing out rather than fundamental analysis.

The initial price surge resulting from this artificial enthusiasm can lead to short-term overvaluation. As more information becomes available over time, IPO firms tend to experience a decline in valuation, moving closer to their true market value. Shiller (1990) supports this argument with survey data from investors, revealing that fundamental val-

uation plays a surprisingly minor role in IPO decision-making. Only every fourth of surveyed investors conducted any value calculations, while many participants viewed the involvement of a reputable underwriter as a key signal of an IPO's quality.

While Shiller (1990) argues that many investors do not even glance at a company's financial figures, it is still important for them to appear strong during the IPO. This so-called window-dressing behavior theory suggests that firms manipulate financial performance metrics before an IPO to create an overly optimistic impression of their profitability and growth potential (Teoh et al., 1998). This behavior is driven by the need to attract investors and achieve higher initial valuations during the offering. Companies may employ aggressive revenue recognition policies, increase discretionary accruals, or temporarily cut operational costs to inflate short-term financial results. However, these enhancements are often unsustainable, leading to a reversion in performance once normal operating conditions resume post-IPO.

Loughran and Ritter (1997) research points out that companies showing strong earnings before their IPO often see those earnings drop after going public. This suggests that their pre-IPO performance might have been pumped up artificially. Over time, market participants recognize the discrepancy between pre-IPO financials and actual performance, which explains why these stocks do not do so well later on.

Long-term performance is closely linked to short-term performance, as highlighted by the impresario hypothesis. Ibbotson and Jaffe (1975) support this view by showing the cyclical nature of IPOs. At times, the IPO market becomes significantly more attractive, with investors willing to pay considerably higher valuation multiples. However, as market conditions normalize, the initial overvaluation corrects itself, leading to a decline in performance after the listing. Understanding these cause-and-effect relationships is beneficial for analyzing the long-term potential of public listings.

2.2 Reverse takeovers

RTOs have become a recognized alternative to traditional IPOs for companies aiming to go public. Academic research presents that this listing method is utilized across various markets globally, including Europe (Dasilas et al., 2016), Australia (Brown et al., 2010), Korea (Song et al., 2014), and the U.S. (Gleason et al., 2005). Furthermore, this approach has been particularly favoured by Chinese firms entering U.S. public markets in the early 2000s (Duval & Quilliam, 2016; Lee et al., 2018). RTOs have gained traction among companies that are cyclical, high-risk, and facing financial difficulties, offering them a "back-door" route to the stock market (Brown et al., 2010). This has enabled some companies to bypass traditional IPO requirements and achieve public listing with potentially less effort (Song et al., 2014). This section explores the transaction structure, characteristics, rationale, and funding structure.

Theoretically, an RTO occurs when a private company acquires a majority stake in a publicly traded shell company, effectively merging with it to access public markets. In practice, however, the process is structured so that a publicly listed company with no operating assets acquires a private company by issuing a significant number of new shares. These newly issued shares serve as consideration for the acquisition, resulting in a substantial dilution of the public company's original ownership, reducing it to well below 50%. Consequently, the private company's owners become the majority shareholders in the newly formed public entity (Sinha et al., 2005).¹³

Following the transaction, the private company's management typically assumes control of the newly public entity, making the formerly private firm the operational core of the listed company (Gleason et al., 2006). However, an RTO, involves multiple stages before

¹³ According to Sjoström (2008), the arrangement is also often carried out as a reverse triangular merger, where the shell company establishes a new subsidiary that then merges with the private operating company. After the merger, the operating company's shares are converted into shares of the shell company, forming a majority ownership, typically around 80-90% of all shares. Sjoström notes that this is a more advantageous option than a direct merger, as the operational company's entity survives the listing, eliminating the need to change vendor, employer identification, or bank account numbers, for example.

Key phases	Description
Acquiring a shell firm and selecting an advisory firm	Identification of a publicly traded entity with minimal assets and no active operations. The advisory firm offers additional insights into shell companies listed on the OTC BB and Pink Sheets while assisting in the preparation of required documentation for SEC submission.
Formulating a funding strategy	Crafting a capital-raising strategy that leverages existing cash reserves, debt financing, or PIPE.
Signing Letter of Intent (LOI)	Formalization of an initial agreement between the shell corporation and the principals of the private enterprise. The LOI confirms the mutual intention to facilitate the private company's public listing through RTO.
Conducting Due Diligence (DD)	Conducting comprehensive DD, with auditors from both the shell entity and the private company reviewing financial and legal aspects, as each will hold a predetermined equity interest in the newly merged organization.
Engaging securities brokers	Engaging at least one market maker to facilitate the trading of company shares and improve market presence.
Disposal of non-cash assets by the shell company	As part of the merger completion process, disposing of any non-cash assets remaining within the shell company.
Post-listing support	Carrying out a reverse stock split when necessary, particularly if the share price is exceptionally low. Additionally, consulting firms provide ongoing post-listing support for up to a year, including facilitating share purchases, coordinating with market makers, and ensuring analyst coverage.

Figure 1. Reverse takeover steps (Brenner and Schroff, 2004)

the new owners fully assume control. For clarity, these steps are summarized in Figure 1. In most cases, the entity's name is changed to reflect the private company's branding, even though its shares continue to trade on the same stock exchange. Furthermore, the operative (formerly private) company's leadership structure and major shareholders largely remain unchanged, despite the firm becoming publicly listed (Sjostrom, 2008).

A key distinction between a traditional IPO and an RTO is that the latter does not automatically bring new capital. While the newly listed company can later raise funds through public markets¹⁴, this requires a separate financing arrangement, complicating direct comparisons between the two methods (Gleason et al., 2006). In fact, many RTO companies pursue PIPE financing soon after the transaction and may even initiate the process before completing their listing (Sinha et al., 2005). However, literature presents mixed evidence on this point: while Gleason et al. (2005) report that fewer than 20% of RTO companies in the U.S. raised public funds within their first two years as public entities, Floros and Shastri (2009) contend that almost half of U.S. RTO firms undertake PIPE financing within their first two public years. Furthermore, Appadu et al. (2014) indicate that in the United Kingdom (UK), 61% of RTOs raise funds at the time of listing, albeit in smaller amounts compared to IPOs. Figure 2 illustrates the typical post-RTO funding stages.

¹⁴ RTOs create an opportunity for private companies to access PIPE financing, which is only available to publicly traded firms (Sjostrom, 2008).

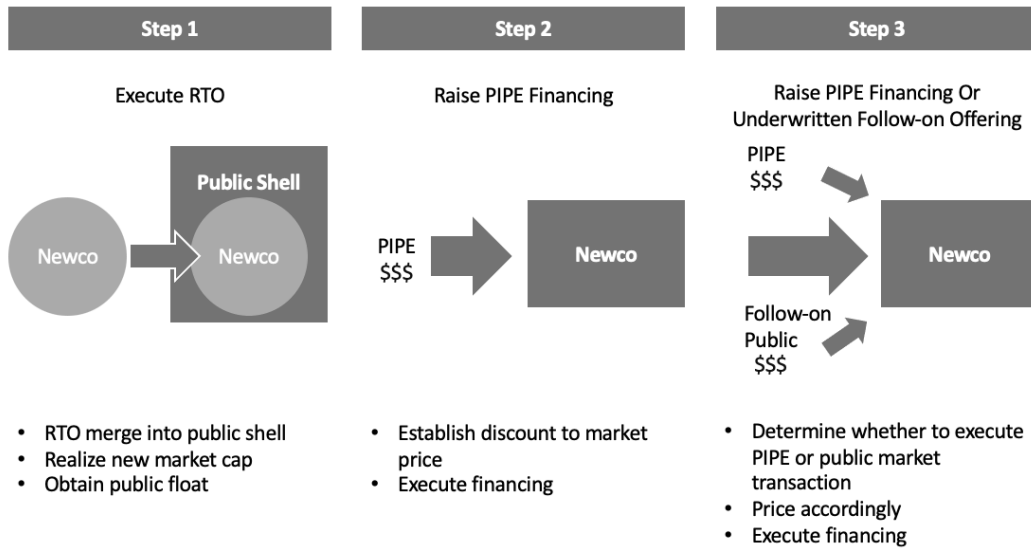


Figure 2. Typical path forward after an RTO (Sinha et al., 2005)

2.2.1 Types of RTOs

While RTOs may appear similar in theory, their classification plays a crucial role in understanding the broader landscape. Appadu et al. (2014) categorize RTOs into three distinct types based on the nature of the public entity involved and the underlying motivation for the transaction. The first two types consist of listed companies that are not established solely for the purpose of merging with a private company, and the last is a shell established solely for the purpose of listing.

The first type of RTOs are mature shells, which are publicly traded companies that have been listed for over a year but are not currently in operation. These are often companies that have faced financial difficulties or exited their markets for other reasons, leaving them inactive cash shells. Due to their poor liquidity and weakened presence on the stock exchange, they become attractive targets for private firms seeking a public listing. This type of RTO is comparable to many cases in the U.S., where the public company exists primarily as a non-operating shell (Appadu et al., 2014).

The second category, synergy RTOs, involves the acquisition of an actively operating, publicly traded company that has been listed for at least a year. In these cases, both the

private and public firms operate within the same industry, and the merger is driven by anticipated operational synergies. Unlike mature shell RTOs, which primarily serve as vehicles for achieving public status, synergy RTOs emphasize strategic growth and business expansion. Their success depends on multiple factors and follows different dynamics compared to acquiring an empty shell. These transactions are more common in the UK than in the U.S. and tend to resemble IPO firms more closely in terms of financial performance (Appadu et al., 2014).

The third category includes Special Purpose Acquisition Companies (SPACs)¹⁵, which are newly created firms listed on the stock market specifically to merge with private companies within a set timeframe, typically between 12 and 18 months. This distinct category necessitates a more detailed explanation, particularly given its extensive discussion within RTO literature throughout the 2000s (Appadu et al., 2014; Sjostrom, 2008; Augusto Arellano-Ostoa and Brusco, 2002; Floros & Sapp, 2011). At the time of transaction, SPACs hold only cash assets and have no operating history, employees, tangible assets, or revenue (Appadu et al., 2014). This makes them a highly speculative bet for investors, who are essentially buying into a blank check company without knowing which private firm it will eventually merge with. In that sense, SPACs operate much like PE firms that focus on one-off deals.

Unlike other shell entities, SPACs offer distinct advantages. Sjostrom (2008) highlights that their cash reserves, which are retained from their listing proceeds, provide a significant financial support for the merging operating company. In addition, SPACs offer immediate share liquidity through an established market for their securities. This feature is further reinforced by the involvement of underwriters from the SPAC's IPO, who often have a vested interest in supporting the stock's market performance post-transaction.

In line with Sjostrom, Augusto Arellano-Ostoa and Brusco (2002) note that a merger with a SPAC can be safer than using a defunct operating company, which may carry hidden

¹⁵ Often referred as "naked shells," as they exist solely as vehicles for future acquisitions.

liabilities from its prior business activities. However, the merger process is not without its complexities. Unlike traditional RTOs, SPAC transactions require the operating company to meet the approval of the SPAC's management team, which acts as a gatekeeper to the deal. Additionally, not all SPACs are structured as RTOs because the specifics of the transaction depend heavily on negotiations between the parties involved¹⁶ (Sjostrom, 2008).

In comparing these RTO categories, Appadu et al. (2014) find that SPACs and mature shells share more similarities with each other than with synergy RTOs, which tend to be larger, more profitable, and less leveraged. Among these categories, mature shells are typically the smallest and least profitable, with lower survival rates and weaker aftermarket performance compared to other types of RTOs and IPOs. While SPACs demonstrate higher survival rates than mature shells, their performance still falls short of synergy RTOs, often exhibiting notable underperformance in the aftermarket. In contrast, synergy RTOs tend to raise substantial capital during the transaction, reflecting a clear focus on future growth. Their survival rates and aftermarket performance are much closer to those of traditional IPOs.

2.2.2 Characteristics

The defining characteristics of RTO set them apart from traditional IPO in several key ways. Academic literature often highlights the notably small size of RTOs, primarily because these companies are frequently in a developmental stage and have not yet built significant business operations. Appadu et al. (2014) specifically mention that SPACs and shell RTOs can be small, possessing less than half the total assets of synergy RTOs. Interestingly, Brown et al. (2010) observe that, post-listing, RTO firms often surpass IPO firms in total asset value following the consolidation of assets from both the private and shell companies into the newly formed entity.

¹⁶ Sjostrom (2008) provides an example of a 'cash-out merger' where a substantial part of the SPAC's IPO-proceeds is used to buy out the target company's shareholders, leaving that capital unavailable for the operating company after the merger.

Since initially smaller RTO candidates have limited financial resources for the listing arrangements, going public via an IPO can be prohibitively expensive. RTOs, conversely, offer a more cost-effective structure and a faster route to public listing as they bypass the costly underwriting hours typically required from investment bankers (Carpentier et al., 2012; Appadu et al., 2014). By circumventing the key gatekeepers, RTOs are prone to increasing information asymmetry between investors and company management. This situation can be particularly problematic for retail investors, especially as Carpentier et al. (2012) and Adjei et al. (2007) indicate that these companies often enter the stock market without strong financial performance or revenues.

According to Carpentier et al. (2012), the rational expectations hypothesis suggests that the poor quality and opacity of issuers, coupled with potential opportunistic behaviour from management, should be incorporated into investors' expected returns. Compared to IPOs, the limited disclosure can further exacerbate the already low stock liquidity of small companies, thereby increasing the cost of equity. However, the authors posit that, due to behavioural theories, this rarely happens, as investors often act irrationally¹⁷. In such cases, investors might drive stock prices above their fair value. The disparity between the stock price and its long-term true value is contingent upon the relative strength of these theories and the dominance of either the cost of capital or over-optimism.

Following Carpentier et al. (2012), it can be posited that irrational behaviour is less prevalent in the U.S., given that private investments in this market are predominantly made by large institutional investors who are less susceptible to such biases. Furthermore, the

¹⁷ Especially when the stock's value is difficult to assess and market uncertainty prevails.

U.S. market has matured in this century, and RTO oversight has improved with SEC intervention. Consequently, instances of fraud¹⁸ at the expense of retail investors have decreased compared to the past.

Despite evolving regulation, academic literature continues to characterize RTO arrangements as highly speculative, even within the U.S. context. Evidence suggests that over half of RTOs ultimately end up in bankruptcy or delisting, resulting in substantial losses for speculative retail investors (Gleason et al., 2005). The speculative nature is further compounded by the observation that 73% of companies combining in RTOs do not operate within the same industry, thereby precluding the formation of any synergies. Most frequently, these companies operate, according to Brown et al. (2010), in rapidly growing sectors such as high-tech industries.

However, strong academic evidence for an unambiguous industry representation is not found in other literature. For example, Gleason (2006) does not find a significant overrepresentation of high-tech firms in the U.S. RTO market. Instead, their analysis shows that industries such as fabricated metal products, wholesale trade, finance, insurance and real estate (FIRE), and the services sector are dominant, collectively accounting for 62% of their sample. Thus, based on current literature, RTO listings cannot be unambiguously linked to specific industries; rather, they represent company-specific decisions.

2.2.3 Strategic rationale for RTOs

The decision to pursue an RTO is influenced by a combination of strategic, economic, and market considerations. As mentioned above, a key distinction between an RTO and a traditional IPO is that an RTO does not raise new capital at the time of listing. For this reason, an RTO can be an attractive option for companies whose primary interest is not

¹⁸ According to Gleason (2005), shell company insiders have exploited this arrangement by later selling their own shares at a favorable price to unsuspecting investors. However, on April 14, 2004, the SEC announced it would begin to more aggressively monitor shell companies to alleviate market concerns about insider abuses.

to seek additional capital from the market. Thus, through the listing, the company gains all the benefits of public trading introduced at the beginning of Section 2, and its owners do not need to dilute their ownership with new capital.

Because the RTO does not automatically raise new capital, it can often be completed in 1–5 months, which is significantly faster than the IPO process, which can take several months or even over a year (Carpentier et al., 2012; Duval & Quilliam, 2016; Sinha et al., 2005; Song et al., 2014). This shorter duration is also frequently cited as a contributing factor to the lower costs of RTOs. For instance, Gleason (2005) finds in his study that the combined fees for the buyer and target company in RTOs average only 2.72% of the transaction value, whereas in IPOs, these fees are around 11%.

The overall cost of RTOs, however, consist of two distinct categories. The first comprises direct costs, which include fees for underwriters, lawyers, auditors, and consultants. The second category is indirect costs, related to the potential underpricing of shares, regulatory requirements, and the allocation of management resources during the listing process (Song et al., 2014). Among these, indirect costs are particularly contentious in academic research. According to Appadu et al. (2014), the ultimate costs are contingent upon the agreed-upon percentage of shares retained by the original shareholders in the newly formed entity. Additionally, they highlight that RTO transactions entail fees from shell company promoters, calculated as a percentage of ownership they get in the resulting entity.

The more complex nature of RTOs can also create risks in assessing their cost structure. For instance, Brown et al. (2010) point out that while RTOs are often marketed as a quicker alternative, the intricacy of these transactions, especially concerning readmissions and capital raising, carries the risk of extending timelines, potentially even beyond those of IPOs. Additionally, the restructuring costs of a public company can be substantial, according to Pavabutr (2019), and they carry risks not inherent in IPOs. These risks

include, for instance, the potential for overpaying for the shell company and the failure of the merged entity's synergistic value to materialize.

Finally, in addition to cost structure and speed, regulatory factors in some markets also influence why companies opt for an RTO. In Canada, Carpentier et al. (2012) state that RTOs are less regulated than IPOs, making them an attractive option for unprofitable or revenue-less companies seeking to list at lower costs. Unlike IPOs, which require extensive disclosure and continuous interaction with regulators, Canadian RTOs are primarily regulated by stock exchanges rather than securities legislation. This regulatory flexibility makes RTOs particularly appealing to companies suffering from high information asymmetry and poor financial performance.

However, regulatory advantages do not apply everywhere. Pavabutr (2019) notes that in Singapore and Thailand, RTO companies must meet the same requirements as IPO companies, and regulation cannot be bypassed. Similarly, Song et al. (2014) report that in Korea, RTOs were used to bypass IPO requirements until 2006, when the government tightened regulations, and RTO companies were required to meet similar minimum size and profitability criteria as IPOs. The change revealed how the proportion of intangible assets on the balance sheet subsequently decreased significantly more for RTO companies than for IPO companies. This suggests that a larger share of RTO firms consisted of companies with high information asymmetry that capitalized on low listing criteria.

In line with Pavabutr and Song et al., Dasilas et al. (2016) observe that the regulatory framework in the UK is as strict for RTOs as it is for traditional IPO listings. They note that this differs from the U.S. in terms of documentation requirements, shareholder approval, capital raising at the time of listing, and corporate governance. Appadu et al. (2014) state that companies listing on the London Stock Exchange (LSE) must prepare a prospectus, similar to other IPO companies, whereas in the U.S., distributing a private placement memorandum detailing the deal terms and some company information suffices. They

see that the U.S. model, compared to the UK model, increases information asymmetry and reduces market confidence in RTO firms' performance.

Regarding regulation, tax reasons can incentivize companies to conduct an RTO. Pavabutr (2019) and Dasilas et al. (2016) suggests that some firms merge with financially distressed public companies to utilize their accumulated losses, thereby reducing future taxable income. This strategy is particularly beneficial for profitable private companies aiming to lower their tax liabilities. Complementing Pavabutr's (2019) observation, Gleason et al. (2005) find that, according to the management of listed shell companies, the most common reason for engaging in such a transaction is the private party's strong financial position.

2.2.4 PIPE financing

The lack of immediate capital in RTOs can hinder a newly public company's ability to grow, innovate, and compete effectively, making it difficult to compare to IPOs that have received a capital injection. While some RTO firms do not need additional funding, for those that do, securing external capital becomes essential after the listing.¹⁹

A widely used financing option for RTO firms is Private Investment in Public Equity (PIPE) transactions²⁰, which have grown in popularity in the U.S. since the early 1990s. This method has typically been utilized by issuers with significant capital requirements, such as those in the life sciences and biotechnology, real estate investment, and technology sectors. More established issuers often consider PIPE transactions as an alternative to shelf takedowns, traditional follow-on offerings, or bought deals, or as a means to provide liquidity to existing shareholders (SEC, 2006).

¹⁹ According to Appadu et al. (2016), additional capital is often raised to finance, for instance, future acquisitions, in which RTO firms tend to be even more active than IPO firms over a three-year period. They report that 46% of RTOs completed at least one acquisition within three years of going public, compared to 40% of IPOs during the same timeframe.

²⁰ The investors in PIPE transactions can be described as 'venture capitalists' who acquire significant ownership stakes and provide multiple rounds of financing to help companies meet the listing requirements of major U.S. stock exchanges (Floros and Shastri, 2009).

Between 1996 and 2006, PIPEs surpassed Seasoned Equity Offerings (SEOs) in both deal volume and dollar value, and between 2001 and 2015, small companies with a market cap of less than \$1 billion raised approximately \$243 billion in PIPE transactions. The U.S. remains the largest market for PIPE financing, with an average annual deal value of \$46 billion between 2005 and 2015, compared to \$29 billion in Asia and \$35 billion in Europe (Andriosopoulos & Panetsidou, 2021).

In a PIPE transaction, publicly traded companies privately sell securities, often at a discount to the market price²¹, to large institutional investors²². There can be two types of PIPEs in the market, traditional PIPEs being one where investors commit to buying shares at a fixed price, and structured PIPEs being the other where shares are purchased at a variable price. Fixed-price PIPEs are riskier for investors because they are exposed to price fluctuation risk until the registration becomes effective, as the price is determined only at the time of the purchase agreement's signing (Chaplinsky & Haushalter, 2010).

According to Dai (2007), traditional PIPEs represent the most frequently used security type in the PIPE market, both by transaction volume and capital raised. Between 1996 and 2007, these accounted for 70% of the market based on transaction count and 77% based on capital raised. Structured PIPEs have more complex contractual terms and are typically based on floating-rate convertibles²³. However, the popularity of these floating-rate convertible PIPEs is declining because SEC investigations have uncovered unlawful activities among investors in this category, including insider trading and market manipulation.

²¹ However, 70% of RTOs offer investors additional benefits beyond just a discounted purchase price (Chaplinsky & Haushalter, 2010).

²² In practice, investors sign a purchase agreement, committing to buy securities, while the company receiving the financing, in turn, files a resale registration statement so investors can resell the shares to the public (SEC, 2006).

²³ These only make up 11% of the total market.

Regardless of whether using traditional or structural PIPE financing, it can significantly reduce information asymmetry, especially for RTOs because PIPE investors typically conduct due diligence on the issuer. This involves examining the company's public data and potentially engaging in discussions with its management. Hertz and Smith (1993) suggest that the discount investors receive on the financing compensates them for this due diligence, which, in turn, benefits all subsequent investors through signalling the quality of the issuer. This is a crucial point, particularly for Hypothesis 3, which posits that PIPE-financed RTOs could perform better than their non-PIPE-financed counterparts.

2.2.4.1 Key features of PIPEs

The characteristics of PIPE issuers differs significantly from conventional funding sources. Many PIPE issuers are young, small, and exhibit signs of financial distress, often struggling to secure capital through traditional public offerings. Chaplinsky & Haushalter (2010) highlight that over 84% of PIPE issuers report negative operating cash flow in the year prior to issuance, with more than half experiencing declining stock prices. Additionally, a significant portion of these firms risk running out of cash within a year, limiting their access to conventional debt or equity financing.

Due to these operative factors, PIPE financing is an excellent alternative, offering companies quick access to capital²⁴, which is especially beneficial for those who are running out of cash. These transactions often have lower overall costs and less paperwork²⁵, making them also an efficient way to raise capital. On the other hand, these also help companies broaden their investor base with credible institutional investors and offer flexibility²⁶, as companies only need to announce the transaction once binding investor commitments are secured (SEC, 2006).

²⁴ The closing and transfer of funds can take place quickly, often within just seven to ten days after receiving the investment commitments.

²⁵ The required documentation includes a prospectus detailing the financing terms, a company description, a purchase agreement, registration rights, and other legal documents (Chaplinsky & Haushalter, 2010).

²⁶ Fixed-price PIPE agreements include a convenient built-in feature that prevents investors from hedging their commitments through short selling, which might otherwise put downward pressure on the stock price.

PIPE financing also has its downsides, as Sjostrom (2008) points out. He argues that this financing method, in fact, can become costly for companies, because it often represents their only available option. The study suggests that PIPE investors can often lock in profits from their investments due to favourable deal terms and a significantly lower market price. Furthermore, PIPE transactions typically involve other instruments that grant rights to future cash flows.

Dai (2007) also contends that, due to the high-risk nature of PIPE issuers, financing costs are higher than those of traditional SEOs. Similar to IPOs, PIPE financings incur not only direct agent fees but also indirect costs, such as 'money left on the table', which is the percentage difference between the offer price and the closing price on the day prior to the offering. These discounts in PIPE offerings are often much higher than those seen in SEOs. Sjostrom (2008) suggests that the net purchase discount for PIPE deals ranges from 14.3% to 34.7%. This stands in notable contrast to the 17%–19% IPO underpricing demonstrated by Ljungqvist (2007) and Westerholm (2006).

PIPEs operate within strict regulatory boundaries, allowing only a select group of accredited investors to participate. These investors range from financial institutions such as banks and insurance companies to high-net-worth individuals and large corporate entities. Eligibility is determined by asset thresholds, income levels, or the nature of the investing organization. As illustrated in Figure 3, hedge funds dominate the PIPE market, accounting for nearly one-third of total investment. Pension funds, government entities, and corporations each hold a substantial share, contributing approximately one-sixth of the market. Investment advisors, mutual funds, PE firms, and buyout groups also play a notable role, while venture capital (VC) firms represent a smaller segment. The remaining investors, including broker-dealers and charitable trusts, collectively make up the residual share.

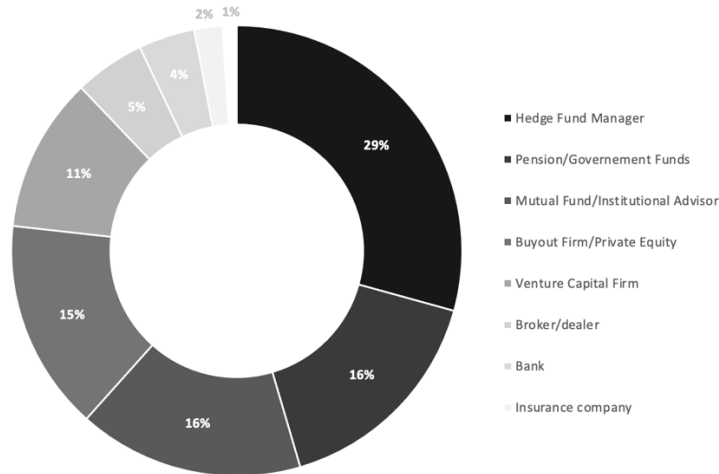


Figure 3. Market share by PIPE investors type (Dai, 2009).

These investors often find it difficult to realize their holdings due to low liquidity. Chaplinsky & Haushalter (2010) show that shares issued through PIPE are, on average 36 times (median 18 times) the company's daily trading volume. This effectively locks PIPE investors into their investments, exposing them to significantly more contractual risk compared to regular public investors. Sjostrom (2008) also notes that investors are required to hold these securities for at least one year until the SEC declares the resale registration statement effective.

2.2.4.2 PIPE performance

According to Chaplinsky & Haushalter (2010), one of the most significant risks for post-PIPE performance is that the issuing company will continue to underperform operationally by undertaking negative net present value projects. Because of this, investors often aim to protect their risk by negotiating rights that safeguard the value of their investment if the stock price declines. In variable-price deals, issuers can negotiate a "cap" or "floor" to control the financial impact of stock price swings or other circumstances.

Market reactions to PIPE announcements have been studied in previous academic literature, yielding varying regional results. Andriosopoulos & Panetsidou (2021) find that in the U.S., PIPE announcements generally trigger a positive market reaction, whereas in

Europe and the Asia-Pacific region, they generate a negative response. Regardless of the initial market reaction, PIPE issuers across all regions tend to experience poor stock performance in the year following issuance, with average returns ranging from –21% in Europe to –44% in the U.S. Contrary to this observation, Duval and Quilliam (2016) find that U.S. PIPE investments can generate positive returns in both the long and short term when combined with RTOs. This is a highly interesting finding in the context of Hypothesis 3.

Andriosopoulos & Panetsidou (2021) further observe that structured PIPE transactions underperform traditional PIPEs across nearly all regions and timeframes. This effect is particularly pronounced in the U.S., where they lose approximately 70% of their value. The authors suggest this aligns with the permanent dilution caused by convertible investors, resulting in downward pressure on the stock price and allowing for advantageous conversion. Conversely, the study notes that common stock PIPE issuances²⁷, in particular, perform considerably better than other security types across almost all regions.

Dai (2007) also observes that traditional PIPEs garner strong initial market reactions and exhibit less severe underperformance compared to structured PIPEs in the long run. However, his research primarily highlights significant differences in market reactions to PIPE investments based on investor type. PIPEs backed by venture capital firms tend to experience positive immediate cumulative abnormal returns (CARs), whereas those funded by hedge funds often see declines. This divergence extends into long-term performance, with VC-backed PIPEs consistently generating strong abnormal returns over a year, while hedge fund-backed PIPEs do not to achieve similar gains.

The study suggests these differences arise from the contrasting investment approaches of VC firms and hedge funds. VC investors usually aim for long-term growth by taking significant ownership, securing board positions, and actively contributing to strategic decisions. They also tend to hold onto their investments for longer, strengthening their role

²⁷ That is, PIPE transactions that do not include investor protection mechanisms.

in how the company is run. On the other hand, hedge funds prioritize quick exits and focus on short-term trading gains, rarely engaging in company oversight. The continuous involvement of investors appears to be a crucial factor affecting how a stock performs after a PIPE deal, highlighting how important it is to actively participate in driving positive results (Dai, 2007).

Consistent with prior research, Momtaz (2022) observes that U.S. issuers experience negative returns of up to -15% in the first year. Conversely, they note that investors, benefiting from favourable terms, enjoy positive returns. This suggests a transfer of value from original to incoming shareholders. However, the author also finds that new accredited investors can not only improve management oversight but also, in line with Hertz and Smith (1993), reduce information asymmetry, both of which have potential enhance post-PIPE returns.

3 Literature review and hypothesis development

A thorough exploration of this thesis's topic necessitates a comprehensive theoretical diagnosis of RTOs. Therefore, this section focuses solely on existing research, approaching the subject through the lens of RTO companies' post-listing stock market performance and their operational development. These findings establish the framework for this thesis' hypotheses and the analysis of its results.

3.1 Stock price performance

The existing literature examines how equity markets react to RTO announcements, with interest on both short- and long-term stock performance. Generally, these studies find that RTO announcements cause a temporary jump in stock prices, largely driven by investor speculation and market enthusiasm. However, long-term performance tends to differ significantly depending on factors such as firm quality and financial health, which makes it crucial to investigate firm characteristics after stock price analysis. Empirical research on this topic frequently employs event study methodologies, measuring abnormal stock returns around announcement dates and over several months to assess investors' immediate reactions and long-term investment strategies regarding RTO transactions.

Given that a significant portion of RTO literature focuses on North America, particularly the U.S., the findings regarding stock market performance in literature review are divided into two sections for clarity. The first will cover studies from the North American market, followed by research from other market regions, including Europe and Asian countries.

3.1.1 Evidence from North America

Unlike many other fields of economic research, RTO literature lacks a single, seminal study that serves as the foundation for subsequent research. Sources from the 20th century primarily consist of individual non-academic articles on the topic, which later

sparked interest among researchers for more in-depth study. To the best of my knowledge, Gleason et al. (2005) are the first to examine the performance of RTOs as an alternative to IPOs in modern research. Their study responds to earlier 20th-century research that debated the advantages and disadvantages of IPOs and whether companies should go public at all.

In their study, Gleason et al. (2005) focuses on investors' reaction to the U.S. RTO announcement between 1987 and 2001. The authors find that shareholders of public shell firms experience significant wealth gains at the announcement, with CARs reaching 25.1% over a three-day (-1, +1) event window²⁸. The return is clearly higher than the average IPO underpricing previously discussed, which is around 15% for a nearly equivalent period (Loughran and Ritter, 2004). On the other hand, it aligns well with Bradley et al.'s (2006) study on U.S. Penny Stock IPOs, which observed a first day return of 22.4%. Gleason et al. (2005) conclude that RTOs may offer a viable alternative to traditional IPOs, allowing companies to mitigate the costs and temporal uncertainties associated with the cyclical IPO market.

Gleason et al.'s (2005) study sparked interest among other researchers in investigating the topic. Since they do not examine long-term stock returns, their study also leaves a suitable gap for further research. Floros and Sapp (2011) address this gap by analyzing long-term U.S. RTO performance and finding that RTO firms report significantly weak returns over longer periods, which is in line with the literature of IPO performance discussed before (Ritter, 1991; Levis, 1993, Chen et al. 2013). Their study shows that fewer than 10% of RTO firms achieve positive long-term BHARs, with an average BHAR of -60.9% over an 18-month period.

²⁸ By further examining the factors driving this short-term reaction, Gleason et al. (2005) regress the (-1, +1) CARs from the event study analysis on deal-specific characteristics and find that the market response is particularly positive for financially stable and liquid firms.

Floros and Sapp (2011) still find that short-term returns are strongly positive, supporting Gleason et al.'s (2005) findings. Their paper reveals an average three-month return of 48.1% following an RTO²⁹. The authors divide the short-term results based on whether they occurred around a non-binding LOI or after the official listing³⁰. They find a 26.2% positive CAR result in the [-30, -1] period before the announcement, indicating that investors anticipate the market reaction if the LOI is likely to go through. Because the market has already anticipated returns based on the LOI, they are no longer as significant on the listing day. Consequently, for the CAR in the [-30, +30] window, the authors observe a return of only 17.4%.

The results raise questions about whether these findings are consistent across all types of RTOs or if some perform better than others. Floros and Sapp (2011) address this by examining the differences in returns between SPACs and traditional shell companies, which is also critical for categorizing the sample in this study. As shown in Figure 4, they find that shell company RTOs significantly outperform SPACs. Their study reports a 30-day CAR of 3.85% for SPAC, whereas the 18-month BHAR stands at -75.7%. The results suggest that these two RTO types should be analyzed separately when examining performance. However, the broader applicability of their findings is limited by the study's focus on RTOs conducted only in 2007–2008, a period that may be considered exceptional due to the financial crisis and its impact on stock markets.

²⁹ However, they emphasize that returns are highly skewed, meaning that an indiscriminate investment strategy across all shell company RTOs would likely lead to losses.

³⁰ A LOI can precede the actual listing by a few days to several months. Floros and Sapp (2011) observe 75 LOIs from their sample of 298 RTOs, of which only 26 fall within 30 days of the actual listing date.

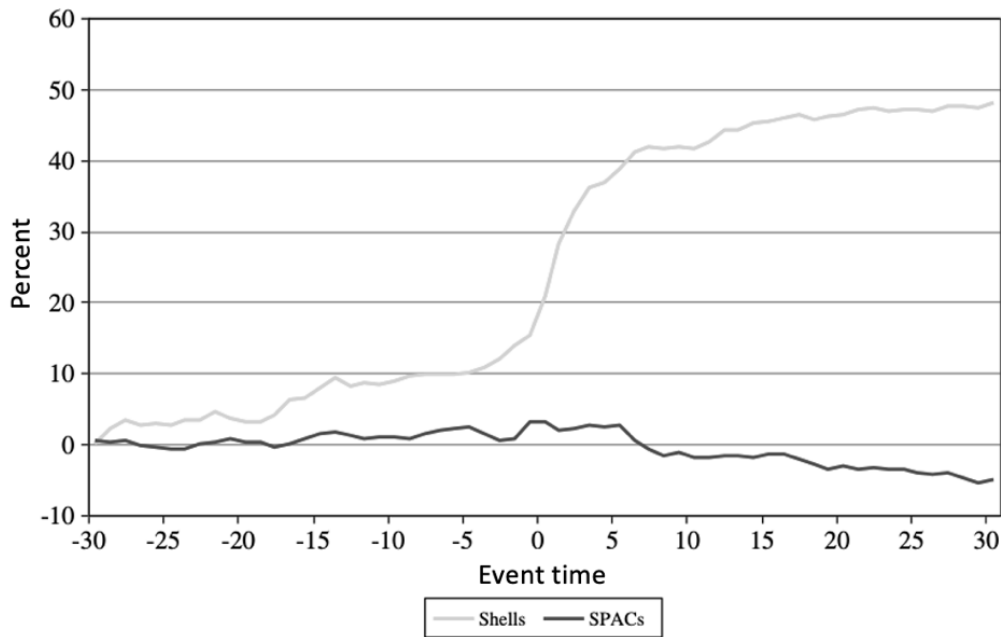


Figure 4. RTO CARs (days): SPAC versus Shells (Floros and Sapp, 2011)

Carpentier et al. (2012) find similar results in Canada to what Floros and Sapp found in the U.S. The authors analyze the stock returns of IPO and RTO firms, focusing on new listings on the TSX and TSXV exchanges between 1993 and 2003. Their findings show that lower listing requirements in Canada negatively impact investor wealth, as RTOs significantly underperform IPOs in the long run due to higher information asymmetry and weaker regulatory oversight³¹. The study highlights this performance gap, with the median three-year BHAR for RTOs at -103.78% , compared to -70.81% for IPOs, emphasizing the importance of transparency in public listings. The authors find that firms choosing IPOs benefit from regulatory certification, leading to higher valuations and stronger post-listing performance.

Comparing Carpentier et al.'s (2012) findings to prior literature's observations on PSIPOs, RTOs do not necessarily perform worse than IPOs, though the results are diverse. Bradley et al. (2006) observe that over a 3-year period, PSIPOs yielded a return of -101.8% , which

³¹ Unlike IPOs, which require full disclosure and rigorous regulatory scrutiny, RTOs allow firms to go public without meeting the same transparency standards (Carpentier et al., 2012).

is significantly weaker than what Carpentier et al. (2012) found. On the other hand, Konku et al. (2012), find even less negative returns for PSIPOs noting that returns only deepened from a mean of -22% in the third year to -61.9% by the fifth year.

The studies discussed previously do not reveal whether PIPE financing influences the post-listing performance of RTOs. Understanding this is particularly critical for this study forming the basis for the research framework. Duval and Quilliam (2016) explore this topic by analyzing the performance of 492 U.S. RTOs and 310 Chinese foreign RTOs in the US market between 2008 to 2013. The authors categorize RTOs based on whether they include PIPE financing and find that, regardless of whether the firm is Chinese or U.S.-based, PIPE-financed RTOs significantly outperform those without PIPE financing.

Examining Buy-and-Hold Return (BHR) from 30 days before to 30 days after the transaction, Duval and Quilliam (2016) report that Chinese RTOs without PIPE financing achieve returns of 16.44%, while PIPE-financed firms see substantially higher returns of 37.22%. The gap is even more pronounced in U.S. transactions, where PIPE-backed RTOs generate returns of 16.73%, compared to just 3.54% for non-PIPE firms. This performance advantage persists over the long term, with PIPE-backed RTOs maintaining superior returns for up to four years after the transaction.

3.1.2 Evidence from other markets

To understand the universality of prior research findings, it is necessary to examine how RTOs perform in Europe and emerging markets. Pioneers in research within Europe include Appadu et al. (2014) and Dasilas et al. (2016), who find similar results with those observed in the majority of research conducted in the U.S.

First, Appadu et al. (2014) examine 243 RTOs and 1,643 IPOs³² on the LSE between 1995 and 2012. They show that UK RTOs underperform their benchmarks over a 36-month period, with value-weighted BHARs declining by -30.64% , compared to a statistically insignificant positive return of 15.33% for IPOs. However, smaller RTOs tend to outperform larger ones, reversing the patterns the authors observed in IPOs. Over a six-month period, RTOs and SPACs exhibit nearly mirror-image returns, with IPOs delivering a 7.55% gain, while RTOs experience a -7.35% loss. Among RTO types, SPACs and shells show the weakest long-term performance, while synergy RTOs perform relatively better. Still, the performance gap between shells and SPACs is significant, as SPACs consistently generate nearly twice the negative returns across all observed timeframes, ranging from six months to three years. This finding aligns with Floros and Sapp (2011), who also highlight the weak performance of SPACs.

Dasilas et al. (2016) extend the scope of UK RTO research by incorporating also other European markets, focusing on both short-term stock price reactions and long-term price development. Their study, based on 222 RTOs from 1991 to 2011, considers the differences in corporate governance and investor protection in these regulatory regions. The results show that overall RTOs generate short-term market gains, with a mean three-day CAR of 9.56% , but experience significant long-term underperformance, with stock prices declining by -24.04% over two years.

The authors find that RTOs executed in the UK generate significantly higher market reactions than those in non-UK Europe³³. They attribute this to stronger minority shareholder protection and more effective corporate governance in the UK. Private firms may be willing to pay a higher premium in countries with stronger shareholder protection, as

³² Covering both the main market and the Alternative Investment Market (AIM), with AIM accounting for 85% of RTOs.

³³ In the UK, returns for the $[-1, +1]$ period are 13.3% , whereas in the rest of Europe, they stand at 5.54% for the corresponding timeframe.

it is expected to lower the cost of capital and increase competition among bidders (Dasilas et al., 2016). This finding supports Appadu et al. (2014)'s observation that improved disclosure reduces information asymmetry and increases market confidence.

Dasilas et al. (2016) further find that industrial non-focus RTOs, where the public and private firms operate in different industries, experience stronger short-term market reactions than those maintaining the same industry focus. On the announcement day, industrial non-focus firms achieve a mean abnormal return of 3.19%, compared to 2.61% return for deals in the same industry³⁴. However, this optimism does not translate into long-term gains. BHARs for industrial non-focus firms indicate persistent underperformance, with stock prices declining more than those of industry-focused RTOs. Over a 24-month period, these firms experience greater cumulative losses, suggesting that the lack of potential synergies begins to emerge.

Song et al. (2014) compare the stock price performance of Korean VC-backed and non-VC-backed RTOs and IPOs between 2000 and 2010. In line with previous studies, they find that while the immediate market reaction to RTO announcements is positive, with a mean (median) three-day return of 9% (5%), these gains do not persist. Over an 18-month period, RTO firms significantly underperform IPO firms, with a median market-adjusted buy-and-hold return of -72% for RTOs compared to -47% for IPOs. This disparity is attributed to the higher information asymmetry and earlier-stage nature of RTO firms.

Further dividing the sample, the Song et al. (2014) find that VC-backed RTOs outperform non-VC-backed counterparts in the short term, with a mean CAR of 12%, which is 4% higher than that of non-VC-backed firms. They argue that VC-backed firms are willing to pay higher premiums to target shareholders to secure successful transactions. Song's

³⁴ The divergence further widens when extending to the [-1, +1] period, where the CAR for companies in different industries is 13.16%, which is significantly higher than the 4.77% return for deals focused on the same industry.

findings are not only consistent with Ritter's (1991) observations that IPOs do not provide long-term benefits to investors, but also with the previous literature discussed above on how RTOs perform even worse than IPOs.

Challenging prior research, a recent study by Pavabutr (2019) uncovers that RTOs yield an overall positive wealth effect for investors. The author analyzes the stock returns and financial performance of 47 RTOs in Singapore and Thailand between 2007 and 2015, showing that RTOs, in fact, perform well in both the short and long term. Market reactions to RTO announcements are generally positive, with CARs rising by 28.5 % around the announcement dates [-20, +20]. The author also differentiates RTOs by key transaction characteristics, namely distress status, premium paid³⁵, and deal size. Among these, they find that 20 days after announcements, the average CAR for distressed firms rises to 43%, while for non-distressed firms, CAR increases to only 10%. Additionally, the study observes that the CAR for low-premium firms is significantly lower than that for high-premium firms (21% versus 43%), implying that investors interpret high premiums as an indicator of greater consolidated valuation.

Regarding long-term returns, Pavabutr (2019) finds that these merged entities consistently outperform benchmark portfolios over 3-, 6-, and 12-month periods, with the 12-month BHAR reaching 36.5%. These findings support the view that such transactions do not destroy value beyond the short-term market reaction. Moreover, the study reports that distressed firms exhibit four times higher BHAR returns (128% compared to 28%) than those of non-distressed firms across all evaluation periods.

Finally, Lee et al. (2018) examine RTOs as an alternative to traditional IPOs in the Chinese market, where IPO processes can be heavily congested due to government policy on IPO quotas. According to their findings, all companies listed via RTOs in China would also be eligible for an IPO in terms of regulation. However, due to the speed of the process, many

³⁵ This metric represents the percentage gap separating the issue price prior to consolidation from the volume-weighted average price (VWAP).

companies opt for an RTO, even though they might have to pay a significant sum for the shell company compared to what shells cost in the Western markets. Their observations indicate that the average first-day abnormal return for these RTO companies is 120%, while for comparable IPO companies, it is 117%. However, median returns are considerably lower (55% and 53%) due to skewed data.

In the long term, Lee et al. (2018) show that RTO firms' BHARs do not exhibit significant changes over the subsequent two years. In contrast, IPO firms' abnormal returns turn significantly negative starting from the first month and continue for the next two years. While RTO returns are around 0% after two years, IPO returns are more than -20% negative.

Overall, as mentioned by Dasilas et al. (2016), this review finds that prior literature suggests U.S. RTOs to have more pronounced short-term reactions to announcements compared to their European or emerging market counterparts. Dasilas et al. explain this by suggesting that countries lacking strong minority shareholder protection experience weaker reactions to announcements. According to them, this might even lead investors to overlook the weak operational performance of RTOs and rely too heavily on investor protection. Other explanatory factors can include the fact that U.S. companies benefit from better analyst coverage compared to many other markets, possess a significantly larger proportion of institutional owners, and exhibit greater transparency.

The literature review indicates that RTO aftermarket performance pattern resembles IPOs. In the short term, returns are strong as investors anticipate the transaction will create shareholder value and drive future growth. This trend aligns with traditional IPOs' positive short-term performance due to underpricing theories presented before. However, unlike IPOs, information asymmetry in RTOs should lead rational investors to demand higher returns for risk, potentially resulting in weaker returns compared to comparable IPOs (Carpentier et al., 2012). Therefore, the findings from prior literature can be seen to support the Bikhchandani et al. (1992) model, where herd behavior might

drive individual decisions to participate in new listings, as well as Carpentier et al. (2012)'s observations of irrational, behavioral-theoretic conduct. To confirm these findings, Hypothesis 1 is examined, which, as a reminder, states:

H1: The short-term stock price performance of RTOs will be similar to that of PSIPOs.

After an initial period of positive short-term returns, long-term performance often weakens as immature companies frequently fail to meet growth expectations or suffer from business deterioration. Notably, SPACs consistently underperform, delivering the weakest long-term returns among RTO types. Their inclusion in some RTO samples may distort results, which is why they are analyzed separately in this thesis. In contrast, synergy-driven RTOs show the strongest performance, likely due to realized operational synergies.

Unlike IPOs, the long-term performance of non-PIPE-financed RTOs is less likely to be influenced by the agency problems discussed by Jain and Kini (1994) or the cyclical patterns described by Ibbotson and Jaffe (1975), as the number of RTOs does not fluctuate significantly with economic cycles (Carpentier et al., 2012). Instead, their weak long-term performance may stem from the high degree of information asymmetry typical of small firms. If this is the case, PSIPOs should also exhibit weak long-term returns, as shown by Konku et al. (2012), Bradley et al. (2006), and Carpentier et al. (2012). Based on these insights, the second hypothesis is formulated as follows:

H2: The long-term stock price performance of RTOs will be similar to that of PSIPOs.

3.2 Operational performance

As evidenced by prior literature, the long-term stock price performance of RTOs is not favorable, which suggests potential issues with operational performance. Thereby, this section addresses how the financial performance of companies that have undergone RTOs evolves after the transaction.

To begin again with Gleason et al. (2005), they further investigate the reasons behind RTOs' long-term underperformance, focusing on their financial viability. Their findings reveal that despite short-term stock market gains, RTO firms struggle to sustain long-term success, with only 46% surviving beyond two years. Many of these firms enter the transaction already financially distressed, and their failure to achieve meaningful financial improvements post-RTO contributes to high delisting rates. Intriguingly for this study, these observations align closely with Carpentier and Suret's (2009) findings on PSIPOs, as they report that 45.32% of listed companies have no sales at all, and fully half fail to survive the 5- and 10-year measurement periods.

Floros and Sapp (2011) further examine the operative post-RTO performance of shell companies, reinforcing Gleason's finding that their performance remains weak. The authors find that post-merger, these companies frequently face declining cash reserves, negative operating income, and high leverage. They observe that compared to PSIPOs, RTOs are less profitable, more leveraged, have weaker cash reserves, and operate in industries requiring a significant amount of R&D investment.

Consistent with their findings on stock performance, Duval and Quilliam's (2016) study also highlights a significantly higher survival rate among PIPE-financed RTOs compared to non-PIPE RTOs. Within two years, 82% of Chinese PIPE-backed RTOs remained in business, whereas only 58% of non-PIPE Chinese RTOs survived. The gap widens over time, with 61% of PIPE-financed Chinese RTOs still active after four years, compared to just 26% of their non-PIPE counterparts. A similar pattern emerges in the U.S. RTOs, where 24% of PIPE-backed firms survived beyond two years, compared to 19% of non-PIPE firms. These findings align with Floros and Sapp's (2011) claims that RTO companies raising PIPE could achieve greater long-term success than those that do not.

Augusto Arellano-Ostoa and Brusco (2002) analyze the operational performance of RTOs in the U.S. between January 1990 and July 2000. They develop a model suggesting that firms with stronger growth prospects and higher-quality projects prefer IPOs, while

those with weaker prospects are more likely to choose RTOs. This distinction leads to 32.6% of RTO firms being delisted after the transaction, indicating that many fail to meet initial or ongoing listing requirements. This high delisting rate suggests that RTO firms often struggle to establish financial stability and maintain a market presence. Furthermore, the authors note that RTOs frequently fail to raise post-listing financing due to their comparatively few positive net present value investment opportunities.

Analyzing a similar period, Adjei et al. (2008) examine the survival of U.S. firms that go public through RTOs compared to those using traditional IPOs³⁶. Similar to Augusto Arellano-Ostoa and Brusco (2002), the findings indicate that RTO firms are generally smaller, younger, and financially weaker than IPO firms, with many failing to meet initial listing requirements, while all IPO firms meet at least one standard. Survival analysis further reveals that RTO firms experience significantly higher delisting rates, with 42.7% delisted within three years compared to 27% of IPOs. The median RTO firm remains listed for only 24 months, whereas IPO firms typically last at least 37 months. The authors argue that weaker financial fundamentals and the absence of underwriter support are key factors contributing to the lower survival rates of RTO firms.

Interestingly, Appadu et al. (2014) find that the survival rates of UK RTOs are higher than those in the U.S. but still lower than their IPO counterparts. By the third-year post-listing, 80% of RTOs remain active compared to 90% of IPOs. However, the likelihood of survival varies across different RTO types. SPACs have a 75% survival rate, while Synergy RTOs and Mature shell RTOs achieve 85% and 77%, respectively. When excluding delistings due to takeovers, the survival rates across these categories become largely similar. The authors also note that, overall, synergy RTOs are the largest among RTOs in terms of assets and sales. Additionally, they observe that SPACs often merge with already unprofitable companies, unlike synergy RTOs and shells. Contrary to prior studies, the authors

³⁶ They match each RTO firm with ten IPO firms based on industry, listing exchange, and time of issuance, using a sample of 286 RTOs and 2860 IPOs from 1990 to 2002.

discover that companies opting for RTOs demonstrate financial and survival patterns that are largely similar from those of traditional IPO listings.

Again, expanding the analysis to further European markets, Dasilas et al. (2016) examine the operational performance of RTOs and find minimal improvement following the transaction. Both ROA and return on equity (ROE) remain negative, indicating persistent inefficiencies. ROA reaches its lowest point in the year of the transaction (−14.11%) but slightly recovers to −6.34% by the second post-RTO year. Liquidity, measured by the cash to total-assets ratio, deteriorates over time, with cash reserves hitting their lowest levels two years after the RTO, suggesting either operational struggles or heavy investments in restructuring. Despite these challenges, debt to total-assets ratios remain stable at around 20%, indicating that firms prefer to rely on existing cash rather than increasing debt financing. Additionally, sales to total-assets ratios reveal initial inefficiencies but show gradual improvement over time, hinting at some operational recovery.

Pavabutr (2019) emphasizes the role of transaction-specific factors and post-merger financial improvements in driving long-term stock price performance. The study finds that BHRs are closely linked to profitability gains, particularly in ROE, with similar trends observed in earnings per share (EPS) and net income. The author finds significant improvements in revenue, net income, EPS, and ROE, diverging from Dasilas et al. (2016), who report negligible post-RTO financial gains. Additionally, the author observes that all companies survive for more than two years after the transaction, which contrasts sharply with the findings of Gleason et al. (2005), where only about half of the companies remained active.

Pavabutr (2019) further reveals an interesting picture for distressed RTO firms. While they show higher mean profitability, their performance distribution is highly skewed, which leads to lower median profitability. These companies see a sharp rise in their book equity value, 91.31% compared to just 30.17% for non-distressed firms. They also experience better liquidity and increased leverage. However, even with a 20% rise in market

capitalization, median values remain steady. When comparing the first and second years after the merger, revenue and net income growth slow down³⁷. Also, declining ROE growth suggests that early post-merger gains may stem more from financial restructuring than from sustainable operational improvements. Still, the study underscores that RTOs offer notable advantages to public firms, particularly distressed ones, by strengthening earnings and equity positions, even if their long-term stock performance remains weaker.

Floros and Shastri (2009) attribute the weaker performance of RTOs to their inherent characteristics. The authors observe that firms opting for RTOs are typically smaller, younger, less profitable, and less liquid than comparable PSIPO firms. The average RTO company is approximately 2.5 years old at the time of listing, whereas a PSIPO firm is 4.5 years old. In contrast, a traditional IPO typically boasts an operating history of about 7–9 years. Furthermore, RTO firms are more likely to be backed by venture capital and PIPE financing while maintaining lower insider ownership. This further supports the assertion that RTO firms attract companies characterized by high information asymmetry.

Since shell companies are extremely expensive in China, low-quality firms cannot leverage RTOs to circumvent IPO listing costs. Lee et al. (2018) observe that, for this reason, RTO companies in China may be of equal or even higher quality than IPO firms, which contrasts with the findings of Floros and Shastri (2009). They show that the average pre-market assets for RTO firms are approximately \$700 million, which is 67% larger than the average pre-market total assets of about \$420 million for IPO firms.

Furthermore, they find that Chinese RTO firms grow faster and are more profitable in the pre-listing period than their comparable IPO firms. Compared to the year preceding listing, RTO firms (IPOs) increase their sales by 260% (73%) in the two years following listing, while EBIT grows by 249% (62%) in the same time period. Correspondingly, leverage decreases by –0.9% (–10.7%), and cash changes by –0.3% (2.3%). The deteriorating

³⁷ Non-distressed firms achieve stronger median profitability.

cash position is because the authors do not separately account for RTO firms that raise financing immediately after listing, which places IPOs in a different position.

Prior literature indicates that RTOs' stock price performance aligns with their operational viability. This supports the theory of irrational and speculative investor behavior at the time of listing, even though companies show no signs of improved financial health or more profitable future investments at that point. The results also suggest that the decision to go public is ultimately unprofitable for many developmental-stage companies, evidenced by a high delisting rate. To the best of my knowledge, however, no study specifically compares the development of operational key financials in PIPE-financed RTOs, which can significantly influence operational development compared to non-PIPE RTOs, as Duval and Quilliam (2016) show regarding survival rates. As they demonstrate, this can, in turn, impact subsequent stock price performance. Thus, hypothesis 3 is as follows:

H3: RTO firms that raise PIPE financing generate superior returns both in the short and long term compared to firms that do not raise PIPE.

Lastly, since this thesis compares RTOs to very small publicly listed companies, it can be assumed that both groups are at a similarly early stage of operational development. Prior research suggests that RTO firms are often operationally weak, contributing in part to their high delisting rates. If this phenomenon is not unique to RTOs, then PSIPOs in a comparably similar developmental stage should exhibit similar operational performance. Based on this reasoning, the study's fourth hypothesis is:

H4: The operational performance of RTOs will align with that of PSIPOs over a 1 to 2 years after the listing.

4 Data and methodology

As outlined in Section 1.2, this section presents the data and research methods used in this study. Defining these elements establishes the foundation for the empirical analysis, which examines RTO performance.

4.1 Data

This study examines companies that went public in the U.S. between 2000 and 2023 through an RTO. To enable comparability, the research also included data on Penny Stock IPOs from the same period. The time period is chosen to cover the different market phases of the 21st century, including the dot-com bubble, the financial crisis, and the market volatility caused by the COVID-19 pandemic. Thereby the timeline provides the most recent available data to support previous research.

The data has been collected from two main databases in order to create a sufficiently reliable and comprehensive sample. RTO and IPO transactions are gathered from Capital IQ (CIQ) and the financials are collected from LSEG. These data points are manually connected to each other based on ISIN codes. The stock price data retrieved from LSEG is on a daily basis, while the operational data has been collected for the period from $t-1$ to $t+2$ relative to the transaction year, to gain extensive understanding of the operational development during the period.

From the initial sample of IPOs, companies lacking share price data, any operational data, or an industry classification were excluded. Additionally, some of the IPOs are actually SPACs, so these are removed through manual inspection. Further, the IPO dataset is filtered to include only PSIPOs to create a more comparable group to RTOs, following the model established by Floros and Shastri (2009). In this study, a PSIPO is defined as a company that (a) is not traded on the NYSE, Amex, or Nasdaq, and (b) is priced below \$5

Table 1. Descriptive statistics of PSIPOs. This table presents the distribution of PSIPO announcements by year and descriptive statistics for firm characteristics. The sample consists of firms that meet the PSIPO definition between 2000 and 2023. Panel A reports the number of announcements, the percentage share by year, and the total proceeds (in million euros) raised each year. Panel B provides the number of observations (N), mean, standard deviation, 25th percentile, median, and 75th percentile for each variable used in the analysis. Ln(assets) is the natural logarithm of total assets. Debt/assets is the ratio of total debt to total assets. EBITDA/assets is the ratio of earnings before interest, taxes, depreciation, and amortization to total assets. Revenue/assets is the ratio of revenue to total assets. Capex/assets is the ratio of capital expenditures to total assets.

Distribution of PSIPO announcements 2000–2023

Panel A: Distribution by year

Year of Announcement	No. of announcements	Percent	Total proceeds by year (m€)	Percent
2023	15	5.5%	177.8	2.4%
2022	25	9.2%	676.2	9.1%
2021	38	14.0%	1155.3	15.5%
2020	24	8.9%	665.2	8.9%
2019	26	9.6%	914.9	12.3%
2018	25	9.2%	329.5	4.4%
2017	20	7.4%	728.0	9.8%
2016	13	4.8%	181.3	2.4%
2015	6	2.2%	52.3	0.7%
2014	9	3.3%	34.4	0.5%
2013	9	3.3%	16.3	0.2%
2012	8	3.0%	57.0	0.8%
2011	8	3.0%	65.1	0.9%
2010	9	3.3%	246.3	3.3%
2009	8	3.0%	20.2	0.3%
2008	5	1.8%	10.4	0.1%
2007	2	0.7%	205.6	2.8%
2006	3	1.1%	24.8	0.3%
2005	6	2.2%	353.8	4.7%
2004	2	0.7%	50.7	0.7%
2003	4	1.5%	966.5	13.0%
2002	3	1.1%	467.4	6.3%
2001	3	1.1%	63.1	0.8%
2000	0	0.0%	0.0	0.0%
Total	271	100%	7462.2	100%
2000-2007	23	8.5%	2131.9	28.6%
2008-2015	62	22.9%	502.0	6.7%
2016-2023	186	68.6%	4828.2	64.7%

Panel B:	N	Average	Standard deviation	25th percentile	Median	75th percentile
Ln (assets)	247	11.9	13.3	5.9	9.6	10.9
Debt/assets	157	74.0	162.3	5.0	19.3	61.5
Ebitda/assets	160	-74.3	177.5	-72.9	-21.8	1.0
Revenue/assets	162	1.0	2.8	0.0	0.3	1.0
Capex/assets	158	6.1	14.9	0.2	0.8	3.6
Sponsor-backed	17					
High-tech industry	82					

per share at the time of its initial offering. Thus, all the IPOs that do not meet these PSIPO criteria are removed.

As demonstrated in Panel A in Table 1, the final PSIPO sample consists of 271 observations, with a majority occurring in the latter part of the sample period. Over 68% of PSIPOs take place during the years 2016–2023, whereas only 8.5% of PSIPOs are observed in an equally long period from 2000–2007. This disparity in PSIPO frequency between the two periods is plausibly explained by the post-COVID IPO wave and more accurate data. Panel B reports summary statistics for key firm-level financials in the PSIPO sample. The average firm size, measured as the natural logarithm of total assets, is 11.9, with a wide dispersion. The mean debt to assets ratio is 74%, while the median firm has a relatively low leverage of 19.3%, which suggests a skewing of the distribution toward a small proportion of highly leveraged firms. The negative mean EBITDA indicates that the firms had not reached operational profitability prior to the IPO. While mean revenue is roughly on par with total assets, the considerably lower median (0.3) suggests that many firms generate relatively modest revenues. As expected, capital expenditures relative to assets are minimal.

The majority 58% of the PSIPO companies in the final sample are listed on the NASDAQ Capital Market (NASDAQCM). Furthermore, 29% of the sample are listed on the OTC Bulletin Board (OTCBB), 5% on the NYSE American (NYSEAM), and 3% each on the OTCQB, OTCQX, and OTC Pink (OTCPK) markets. In terms of industry sectors, pharmaceuticals comprise the largest share (18%). Banking (16%) and Information Technology (12%) are also strongly represented in the sample. The proportion of other industries in the total sample is less than 10%. The study separately identifies High Tech companies, which include the Information Technology, Financial Technology, Biotechnology and Life Sciences, and Pharmaceuticals sectors.

The PSIPO sample presented above serves as a point of comparison for the results of the RTO sample. The RTO sample is extracted from the CIQ database, and PIPE transactions

from the same time period are also retrieved from the same system. This data is linked together using ISIN codes and each PIPE transaction is cross verified manually with data retrieved from EDGAR. For RTOs, the same selection criteria are applied as for PSIPOs. However, additional exclusions are made when manual review raised doubts about the transaction's precise timing, and this could not be verified through available data and third-party sources. Furthermore, a significant number of RTOs are excluded from the sample if sufficient confirmation of PIPE financing could not be obtained from EDGAR filings, company announcements, or media reports.

Panel A in table 2 indicates a final sample size of 459 RTOs, which are categorized into both SPACs and Shells in order to take into account their key distinctions. Furthermore, these RTOs are segmented into those without and those with PIPE financing. The distribution clearly reflects the SPAC boom of the early 2020s, evidenced by the increased number of RTOs. This phenomenon notably influences the research findings, as nearly one-third of all RTOs are 2021 SPACs. Overall, 62% of all RTOs in the sample period are SPACs, making the distinction between SPACs and Shells extremely important. Additionally, it is notable that approximately 70 percent of RTOs execute PIPE financing, while only 30 percent do not. As evident in both tables, the median values of the operational metrics across the samples do not differ significantly, which makes the samples highly homogeneous and thus facilitating a meaningful comparison between these companies.

Panel B shows that, in terms of operational metrics, PIPE-financed and non-PIPE-financed RTOs are largely similar. Firms that secured PIPE financing tend to be slightly larger, with a median asset level of 12.1 compared to 8.7 (without PIPE financing). Leverage is higher for PIPE-financed RTOs, with a median debt to assets ratio of 27.9% (11.7%). Conversely, PIPE-financed RTOs show stronger EBITDA profitability, with their EBITDA to assets ratio at -21.9% (-44.9%). Revenue to assets ratios are close 0.4 (0.5), and capital expenditures relative to assets remain minimal in both groups with median of 1.9 (2.2). Interestingly, half of all PIPE-financed RTOs are sponsor-backed prior to the event, whereas only one in four non-PIPE RTOs had sponsor involvement.

Table 2. Descriptive statistics of RTOs. This table presents the distribution of RTO between 2000 and 2023 and descriptive statistics for the sample firms. Panel A shows the number of announcements and their percentage share by year, categorized into Shell and SPAC RTOs. Panel B provides the number of observations (N), mean, standard deviation, 25th percentile, median, and 75th percentile for firm characteristics. Ln(assets) is the natural logarithm of total assets. Debt/assets is the ratio of total debt to total assets. EBITDA/assets is the ratio of earnings before interest, taxes, depreciation, and amortization to total assets. Revenue/assets is the ratio of revenue to total assets.

Panel A: Distribution of reverse takeover announcements									
Distribution by year	RTO + PIPE					RTO			
	SPAC RTO		Shell RTO			SPAC RTO		Shell RTO	
	Year of Announcement	No. of announcements	Percent	No. of announcements	Percent	No. of announcements	Percent	No. of announcements	
2023	14	5.3%	0	0.0%	3	15.8%	2	1.7%	
2022	41	15.4%	2	3.4%	7	36.8%	4	3.4%	
2021	139	52.3%	2	3.4%	1	5.3%	2	1.7%	
2020	54	20.3%	2	3.4%	0	0.0%	1	0.9%	
2019	6	2.3%	2	3.4%	0	0.0%	1	0.9%	
2018	5	1.9%	1	1.7%	3	15.8%	1	0.9%	
2017	3	1.1%	1	1.7%	0	0.0%	2	1.7%	
2016	0	0.0%	2	3.4%	0	0.0%	2	1.7%	
2015	0	0.0%	1	1.7%	1	5.3%	4	3.4%	
2014	0	0.0%	4	6.9%	0	0.0%	4	3.4%	
2013	1	0.4%	2	3.4%	0	0.0%	1	0.9%	
2012	0	0.0%	4	6.9%	0	0.0%	2	1.7%	
2011	0	0.0%	4	6.9%	0	0.0%	7	6.0%	
2010	0	0.0%	3	5.2%	0	0.0%	9	7.8%	
2009	1	0.4%	0	0.0%	1	5.3%	4	3.4%	
2008	1	0.4%	2	3.4%	0	0.0%	2	1.7%	
2007	0	0.0%	5	8.6%	1	5.3%	10	8.6%	
2006	0	0.0%	2	3.4%	1	5.3%	10	8.6%	
2005	0	0.0%	7	12.1%	0	0.0%	18	15.5%	
2004	0	0.0%	6	10.3%	1	5.3%	9	7.8%	
2003	0	0.0%	4	6.9%	0	0.0%	7	6.0%	
2002	0	0.0%	0	0.0%	0	0.0%	6	5.2%	
2001	0	0.0%	2	3.4%	0	0.0%	4	3.4%	
2000	1	0.4%	0	0.0%	0	0.0%	4	3.4%	
Total	266	100%	58	100%	19	100%	116	100%	
2000-2007	1	0.4%	26	44.8%	3	15.8%	68	58.6%	
2008-2015	3	1.1%	20	34.5%	2	10.5%	33	28.4%	
2016-2023	262	98.5%	12	20.7%	14	73.7%	15	12.9%	

Panel B:	RTO + PIPE						RTO					
	N	Average	Standard deviation	25th percentile	Median	75th percentile	N	Average	Standard deviation	25th percentile	Median	75th percentile
Ln (assets)	306	13.4	14.4	10.6	12.1	13.1	86	11.6	12.9	5.9	8.7	10.9
Debt/assets	229	230.9	26.6	5.8	27.9	60.1	64	23.2	28.3	2.7	11.7	34.1
Ebitda/assets	260	-80.8	313.2	-73.0	-21.9	-1.7	68	-615.0	17.0	-211.9	-44.9	4.7
Revenue/assets	232	0.7	0.9	0.1	0.4	0.9	58	23.9	181.1	0.2	0.5	1.4
Capex/assets	258	5.6	12.0	0.7	1.9	5.0	61	7.6	15.6	0.5	2.2	7.8
Sponsor-backed	174						35					
High-tech industry	9						18					

The majority of RTO sample is in the Asset Management industry, as all SPACs are categorized within this sector. However, if these are excluded, the largest sector, at 17%, is Media & Entertainment, followed by Oil, Gas and Coal at 13%. The remaining sectors each represent less than 10 percent of the sample. Interestingly, PSIPO and RTO samples are quite similar in terms of mean operational metrics. This comparability strengthens the interpretation of short-term outcomes, as investors are unlikely to perceive either route as inherently superior in terms of operational performance.

After defining the sample, it is important to identify an appropriate benchmark group that accurately reflects the performance of the small firms represented in both the RTO and PSIPO samples. This enables the adjustment of raw returns to isolate the abnormal return attributable to each individual stock. As firm performance is highly sensitive to the chosen benchmark, the selection made in this section is critical for the validity of the study's results. Ritter (1991) identifies three common approaches for selecting a benchmark: a market index, a single matching firm or a control group of comparable firms based on industry, financial characteristics, or size, and a control group matched on alpha and beta for risk adjustment purposes. This study employs returns based on the Russell 2000 market index, as the sample has already been segmented to match the profile of the benchmark index as closely as possible. Moreover, the Russell 2000 provides a sufficiently long and continuous data series with reliable price information, allowing for a robust analysis over an extended research period.

4.2 Methodology

In academic research, stock returns have traditionally served as the predominant metric for evaluating market performance. While accounting figures look backward, stock returns are forward-looking, offering a more robust basis for valuing a company. Consequently, studies primarily employ stock returns to measure performance (Ritter, 1991). Following established literature, this study primarily assesses performance using stock

returns but also supplements the analysis with accounting-based measures. This enhances the overall findings and gives a better understanding of the transactions' economic nature and how they evolve.

Previous research has primarily utilized two main approaches for measuring event returns: the event time and calendar time methods. While the calendar time method is commonly applied in long-term performance analyses, this study adopts the event time approach to measure both short- and long-term returns, ensuring consistency across both time horizons. In the event time methodology, there are three primary measures for analyzing performance: CAR, BHAR, and WR (Wealth Relative). In this study, CAR is used for short-term analysis, while BHAR is employed for long-term performance measurement.

In the event study analysis, official trading days are used to measure return periods. For longer-term measurements (months and years), trading days are calculated based on an assumption of 21 trading days per month and 252 trading days per year. Thus, the longest two-year measurement period consists of 504 trading days. The price data extends through the end of July 2024, meaning that for all events where the full two-year period cannot be observed (i.e., all events occurring in 2023), performance is measured up to the latest available full period. The same method is used in situations where a company is delisted, acquired, or ceases its operations. These observations are nevertheless retained in the study in order to maximize the sample size, particularly for the most recent years, and to avoid data errors.

Since this study also compares IPO returns, no separate risk-adjusted methods were applied to calculate abnormal returns. Unlike RTOs, IPOs have typically been listed for such a short time that it is not feasible to estimate their betas based on historical data. If beta estimation were possible, the betas would have been calculated relative to the Russell 2000 index. Therefore, for the sake of consistency across both samples, market index returns are used without direct risk adjustment methods.

4.2.1 CAR & BHAR

Cumulative Abnormal Returns (CAR) are calculated as the sum of daily abnormal returns, where each abnormal return is the difference between an individual stock's return and the return of the Russell 2000 benchmark index. The formula can be expressed as:

$$AR_{i,t} = r_{i,t} - r_{m,t} \quad (1)$$

where:

$r_{i,t}$ is the return of stock i on day t , and

$r_{m,t}$ is the corresponding daily return of the benchmark index.

Abnormal returns $AR_{i,t}$ represent the difference of a firm's stock return from the expected market return, isolating the stock-specific component of performance. The average abnormal return AAR_t for the IPO sample on event day t is then calculated as the arithmetic mean of all individual abnormal returns.

$$AAR = \frac{1}{N} \sum_{i=1}^N AR_{i,t} \quad (2)$$

where:

N is the size of the sample.

Finally, the CAR from day 1 to day T is derived as the sum of the average abnormal returns over the event window.

$$CAR(1, T) = \sum_{t=1}^T AAR_t \quad (3)$$

According to the traditional model, the t-statistic for *ARR* is calculated using the following formula, which tests whether the average return in a given event month differs significantly from zero. This is done by scaling the average abnormal return by its cross-sectional standard error:

$$t = \frac{AAR_t \cdot \sqrt{n_t}}{sd_t} \quad (4)$$

In this formula, n_t represents the number of firms in the sample on day t , and sd_t is the cross-sectional standard deviation for day t . However, since CARs aggregate monthly abnormal returns over time, they may be serially correlated. Therefore, the t-statistic for CARs is adjusted for autocorrelation in the time-series of AARs. The adjusted t-statistic is calculated according to Ritter (1991) as follows:

$$t = \frac{CAR_{1,t} \cdot \sqrt{n_t}}{\sqrt{t \cdot var + 2 \cdot (t-1) \cdot cov}} \quad (5)$$

Here, n_t again denotes the number of firms in the sample on day t , VAR refers to the average cross-sectional variance from day t_0 to day t , and COV is the first-order autocovariance of the ARR_t series. In other words, this function captures how much the average return on day t co-varies with the average return on day $t-1$.

Because the variable t in the formula refers to the event day being calculated, the function breaks down when calculating returns for day 1, or when the autocovariance equals zero. In such cases, the function collapses to the traditional t-statistic test:

$$t = \frac{\bar{Y} - \mu_{Y,0}}{\sqrt{\frac{s_y^2}{n}}} = CAR_{1,t} \cdot \frac{\sqrt{n_t}}{\sqrt{s_y^2}} \quad (6)$$

Lastly, the calculation of the t-statistic accounts for the impact of both the variance and covariance of temporally dependent abnormal returns (AR_t) on the total variance of the

CAR. This adjustment ensures that the t-test for CAR is statistically valid over a multi-day period. The adjusted formula is as follows:

$$s_y^2 = t \cdot \sigma_y^2 + 2 \cdot (t - 1) \cdot \text{Cov}(AR_t, AR_{t-1}) \quad (7)$$

where:

s_y^2 total variance of the CAR (i.e., the sum of ARs over t months)

σ_y^2 variance of a single month's AR

$\text{Cov}(AR_t, AR_{t-1})$ covariance between two consecutive months' ARs and

t is number of months in the event window.

The CAR method is used in this study to analyze short-term returns. Following Barber and Lyon (1997), buy-and-hold abnormal returns (BHAR) is considered as a more suitable method to measure long-term performance. This method is also supported by the study of Lyon et al. (1999), which states that BHAR results reflect the actual buy-and-hold experience from the investor's point of view. Buy-and-Hold Return (BHR) is calculated using the following formula:

$$BHR_{i,T} = \prod_{t=1}^T (1 + r_{i,t}) - 1 \quad (8)$$

where:

T is the number of months the stock is held

$r_{i,t}$ the raw return of stock i in month t .

BHAR return is obtained by comparing this return to the buy-and-hold return of the market index over the exact same period:

$$BHAR_T = \left[\prod_{t=1}^T (1 + r_{i,t}) - 1 \right] - \left[\prod_{t=1}^T (1 + r_{m,t}) - 1 \right] \quad (9)$$

where:

$r_{m,t}$ denotes the return of the market index in month t .

BHAR returns are calculated using following formula:

$$\overline{BHAR} = \frac{1}{n} \sum_{i=1}^n BHAR_{i,t} \quad (10)$$

To evaluate whether the mean BHAR is statistically different from zero, a skewness-adjusted t-test is applied. This test follows the methodology of Lyon et al. (1999) and accounts for the non-normal distribution of long-run returns, which are often skewed to the right.

The test statistic is defined as:

$$t_{BHAR} = \sqrt{n} \cdot \left(S + \frac{1}{3} \hat{\gamma} \cdot S^2 + \frac{1}{6n} \hat{\gamma} \right) \quad (11)$$

where:

$$S = \frac{\overline{BHAR}_T}{\sigma(BHAR_T)} \quad (12)$$

$$\hat{\gamma} = \frac{\sum_{i=1}^n (BHAR_{i,T} - \overline{BHAR}_T)^3}{n \cdot \sigma(BHAR_T)^3} \quad (13)$$

where $\hat{\gamma}$ represents an estimate of the skewness coefficient.

Although the sample size is reasonably large in this study, skewness bias is still present in the data. As the sample size grows, the central limit theorem ensures that the sampling distribution of the average BHAR becomes approximately normal regardless of the underlying distribution. Still, the BHAR data for both RTOs and PSIPOs has been winsorized to prevent outliers from skewing the results. In this analysis, the extreme 2.5% of values at both the lower and upper ends of the distribution have been replaced with the

nearest values within these thresholds. This method improves the reliability of the results, as the sample of small firms includes significant outliers that would otherwise undermine the robustness of the analysis.

The statistical significance of the medians is assessed using the Wilcoxon signed-rank test. Given the generally large sample sizes, statistical inference is based on the z-value, using the normal distribution as an approximation. Reporting the median adds value particularly in the context of penny stocks, where extreme price movements in some firms may skew the mean.

To determine the statistical significance of the return difference between RTOs and IPOs, this study uses Welch's two-sample t-test. This is a variation of Student's t-test, best suited for datasets with different variances and sample sizes. Consistent with Hypotheses 1 and 2 of the study, the null hypothesis for Welch's t-test is that the two datasets have the same mean. The formula for Welch's t-test is as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}} \quad (14)$$

where:

\bar{X}_1 is the mean of the RTO data

\bar{X}_2 is the mean of the PSIPO data

N_1 is the sample size of the RTO data

N_2 is the sample size of the PSIPO data

s_1^2 is the variance of the RTO data

s_2^2 is the variance of the PSIPO data

The non-parametric Mann-Whitney U test is used in this study for median difference tests, as it is particularly useful when the assumption of normality is not met.

Finally, it is also worth noting that, following Appadu et al.'s (2014) paper, this study calculated both value-weighted mean and median returns, along with their statistical significance, for both the RTO and PSIPO samples. This is done as a precaution, in case larger market-capitalization companies yielded significantly divergent results, which would be important to consider when interpreting the findings. However, given that this study's sample exclusively comprised small market-capitalization companies, the results did not notably differ from the equal-weighted outcomes, and their separate presentation is therefore not deemed necessary.

4.2.2 Multivariate regression

In the long term, stock prices are primarily determined by the present value of expected future cash flows. These, in turn, are influenced by both the company's operational performance and qualitative factors. Consequently, this study examines the role of qualitative firm characteristics in explaining both 14-day CARs and 12-month BHARs. These time horizons are chosen to mitigate the distorting effects of investor overreaction in the initial days, but also to ensure that the results are not overly influenced by information that becomes available much later, which could dilute the relevance of the original indicators.

The empirical approach follows prior literature, including studies by Dasilas et al. (2016), Gleason et al. (2005), and Appadu et al. (2014), which employ multiple regression analysis to assess the impact of operational and qualitative variables on abnormal returns. Multiple regression is a statistical method for examining the relationship between a dependent variable and two or more independent variables. It predicts the dependent variable using a linear combination of explanatory variables, where each variable is assigned a coefficient reflecting its individual contribution while controlling for the influence of the others.

This study uses the Ordinary Least Squares (OLS) estimation technique, which is widely used in econometric analysis. OLS estimates model parameters by minimizing the sum

of squared differences between observed and predicted values of the dependent variable. For the OLS model to yield the best possible estimates, several assumptions must hold:

1. The model is linear in both coefficients and the error term.
2. The error term has a population mean of zero.
3. The explanatory variables are uncorrelated with the error term.
4. The errors are uncorrelated across observations (no autocorrelation).
5. The error term has constant variance (homoskedasticity).
6. No explanatory variable is a perfect linear combination of the others.

When these assumptions are satisfied, the OLS estimator is consistent, unbiased, and efficient. In such cases, OLS produces what are known as Best Linear Unbiased Estimators (BLUE).

This analysis uses multiple linear regression to investigate how various operational and qualitative firm characteristics in explain RTO versus PSIPO returns. The method allows for the assessment of how each explanatory variable contributes to the outcome while controlling for the influence of others. The basic form of the OLS multiple regression model can be expressed as follows:

$$\begin{aligned}
 Y_i = & \beta_0 + \beta_1 \ln(\text{Assets}_i) + \beta_2 (\text{Debt}_i / \text{Assets}_i) + \beta_3 (\text{Revenue}_i / \text{Assets}_i) + \\
 & \beta_4 (\text{EBITDA}_i / \text{Assets}_i) + \beta_5 (\text{Capex}_i / \text{Assets}_i) + \beta_6 (\text{EBITDA}_i / \text{Assets}_i) \cdot \ln(\text{Assets}_i) + \\
 & \beta_7 \text{SponsorBackingDummy}_i + \beta_8 \text{PIPEDummy}_i + \beta_9 \text{ShellDummy}_i + \\
 & \beta_{10} \text{HighTechDummy}_i + \varepsilon_i
 \end{aligned}
 \tag{15}$$

Y_i is the market-adjusted return for stock i .

5 Empirical results

This section focuses on the analysis of the empirical results. It examines the performance of RTOs and compares them to traditional IPO listings. To gain a deeper understanding of these outcomes, RTOs are further examined across several subcategories, looking at both their short-term and long-term performance. The categorization is based on the RTO model and the listing timeframe, split into periods before and after the Jumpstart Our Business Startups (JOBS) Act came into effect in 2012³⁸. The implementation of the JOBS Act and the resulting relaxation of listing requirements may have reduced the relative attractiveness of alternative listing methods.

Lastly, the operational performance of the listing methods is examined over a four-year horizon. These parameters are subsequently used to investigate their influence on companies' stock price performance in both the short and long term. The results are evaluated in relation to the research hypotheses presented in Section 1.1, which are formulated to address gaps identified in the existing literature.

5.1 Short-term returns

The first hypothesis of this study posits that RTOs perform similarly to comparable IPOs in the short term. The potential similarity of these returns is analyzed by comparing the CARs of RTOs and PSIPOs over 1, 3, 7, and 14-day event windows³⁹. Additionally, a difference test is conducted to statistically validate any observed return disparities.

Table 3 presents short-term CAR returns surrounding announcements of RTO and PSIPO. The table is structured into four distinct panels, where Panel A focuses on RTOs that include PIPE financing, Panel B shows RTOs without such PIPE investments (plain RTO),

³⁸ JOBS Act aims to facilitate access to public financial markets for small and growing businesses. The legislation seeks to alleviate the regulatory burden on securities markets, thereby promoting the establishment of new companies and fostering employment (SEC, 2024)

³⁹ The announcement date, defined as time $t-0$, marks the point at which the firm becomes publicly listed, either through an IPO or an RTO.

Panel C presents the CARs associated with PSIPO transactions, and Panel D indicates the statistical significance of the CAR differences.

In line with Duval and Quilliam (2016), Panel A shows that RTOs with PIPE financing consistently generate substantial positive and statistically significant abnormal returns across all examined event windows and subperiods. For instance, over the 14-day window following the announcement, the full sample's mean (median) CAR is a statistically significant 8.9% (0.8%). The more recent 2012–2023 period shows a mean CAR of 6.8% (0.5%). Conversely, the earlier 2000–2011 period yields a larger 25.2% (7.6%) return over the 14-day window. Since 88% of RTO events fall between 2012 and 2023, the returns from the earlier period have only a minor impact on the full sample results.

These results are slightly more modest than those observed by Duval and Quilliam (2016) using the BHAR method, as their study found RTOs generating over 11% short-term returns across all measurement periods from day one. Across all periods, returns are significantly positively skewed, evident in the notably larger mean return compared to the median. This aligns with Carpentier et al. (2012), suggesting investors participate in these offerings because they resemble lottery-ticket stocks.

Panel B presents the results for plain RTOs, i.e. those conducted without concurrent PIPE financing. The most striking observation is that returns are significantly higher throughout the event window, reaching approximately 20–30%. Over the period 14 days, the mean (median) CAR from 2000 to 2023 is 29.4%⁴⁰ (0.8%). In the later 2012–2023 period, the mean CAR decreases to 10.1%, and the median CAR becomes slightly negative at -0.6%, although this median figure is not statistically significant. The results are consistent with those of Gleason et al. (2005) and Pavabutr (2019), who report mean CARs of 25.1% and 20%, respectively, around the event date. On the other hand, the findings exceed those of Song et al. (2014) and Dasilas et al. (2016), who observe CARs of approximately 9% within a three-day event window.

⁴⁰ This figure seems to be inflated by the performance in earlier years of 2000–2011.

Table 3. CAR returns for RTO and PSIPO announcements. This table shows the CAR of RTO + PIPE announcement firms in Panel A. Panel B reports non-PIPE RTO CARs and Panel C presents PSIPO CARs. In Panels A-C, T-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively. In Panel D, the mean difference test is based on Welch's t-test and the median difference test is based on the Mann-Whitney U test. P-values lower than 0.01 are denoted as "<0.01".

Panel A: RTO+PIPE CARs

2000-2023		Mean	Median	2000-2011		Mean	Median	2012-2023		Mean	Median
N	Days	CAR	CAR	N	Days	CAR	CAR	N	Days	CAR	CAR
324	(0,+1)	5.6%	1.1%	38	(0,+1)	2.7%	0.6%	286	(0,+1)	6.0%	1.1%
		(4.7370) ***	(5.9159)			(0.2762)	(1.8499) *			(8.3152) ***	(5.5363) ***
324	(0,+3)	6.9%	0.9%	38	(0,+3)	20.7%	3.1%	286	(0,+3)	5.0%	0.8%
		(2.3684) **	(4.4606)			(0.8337)	(2.9927) ***			(6.0558) ***	(3.6240) ***
324	(0,+7)	7.6%	0.8%	38	(0,+7)	22.9%	2.2%	286	(0,+7)	5.6%	0.6%
		(2.4015) **	(3.3551)			(0.9951)	(2.3712) **			(2.4623) **	(2.6523) ***
324	(0,+14)	8.9%	0.8%	38	(0,+14)	25.2%	7.6%	286	(0,+14)	6.8%	0.5%
		(2.9862) ***	(3.5868)			(2.5216) **	(2.9357) ***			(1.9234) *	(2.5904) ***

Panel B: Plain RTO CARs

2000-2023		Mean	Median	2000-2011		Mean	Median	2012-2023		Mean	Median
N	Days	CAR	CAR	N	Days	CAR	CAR	N	Days	CAR	CAR
124	(0,+1)	20.1%	1.0%	85	(0,+1)	23.3%	1.0%	39	(0,+1)	13.2%	0.9%
		(4.4962) ***	(3.4639) ***			(4.0242) ***	(2.7625) ***			(1.9303) *	(2.1045) **
124	(0,+3)	24.7%	2.0%	85	(0,+3)	30.1%	3.3%	39	(0,+3)	13.0%	0.5%
		(2.3450) **	(3.6602) ***			(1.9887) **	(3.5475) ***			(1.6550) *	(1.1239)
124	(0,+7)	23.8%	1.0%	85	(0,+7)	29.7%	1.4%	39	(0,+7)	10.9%	-0.7%
		(5.0437) ***	(2.3951) **			(4.4775) ***	(2.5294) **			(3.1340) ***	(0.4752)
124	(0,+14)	29.4%	0.8%	85	(0,+14)	38.3%	0.9%	39	(0,+14)	10.1%	-0.6%
		(1.3458)	(2.7299) ***			(2.6500) ***	(2.6327) ***			(0.1693)	(1.0787)

(Continued)

Panel C: PSIPO CARs

2000-2023		Mean	Median	2000-2011		Mean	Median	2011-2023		Mean	Median
N	Days	CAR	CAR	N	Days	CAR	CAR	N	Days	CAR	CAR
131	(0,+1)	-2.1% (-1.6564) *	-0.9% (-2.7702) ***	27	(0,+1)	0.0% (-0.0299)	-0.6% (-0.0961)	104	(0,+1)	-2.7% (-1.6638) *	-0.9% (-2.9393) ***
131	(0,+3)	-2.7% (-1.3043)	-1.4% (-3.0664) ***	27	(0,+3)	-0.8% (-0.8317)	-0.7% (-0.6006)	104	(0,+3)	-3.2% (-1.2291)	-2.0% (-3.0361) ***
131	(0,+7)	-7.1% (-3.5053) ***	-2.9% (-4.3240) ***	27	(0,+7)	-7.5% (-2.8299) ***	-1.1% (-1.2012)	104	(0,+7)	-6.9% (-2.8446) ***	-4.0% (-4.0843) ***
131	(0,+14)	-7.0% (-1.0476)	-3.7% (-3.7834) ***	27	(0,+14)	-11.8% (-2.2048) **	0.2% (-0.2162)	104	(0,+14)	-5.7% (-0.8112)	-4.3% (-3.9274) ***

Panel D: Difference test for CARs

Days	RTO + PIPE vs. PSIPO		Plain RTO vs. PSIPO		RTO + PIPE vs. Plain RTO	
	Mean	Median	Mean	Median	Mean	Median
(0,+1)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0,01)	(0.23)
(0,+3)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0,01)	(0.05)
(0,+7)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.02)	(0.29)
(0,+14)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.01)	(0.23)

Panel C shows that investors, in fact, react negatively to PSIPOs. The results are consistently negative from the announcement day through the 14-day CAR window in both mean and median metrics. These findings contradict not only the traditional IPO literature (Ritter, 1991; Levis, 1993; and Chen et al., 2013), which shows IPOs generating positive short-term returns, but also Bradley et al.'s (2006) PSIPO study, which reported a 22.4% average initial return. In contrast, this study reports a mean (median) CAR of -7.0% (-3.7%) over the full 14-day window. This negative investor reaction persists in both sub-periods but is particularly pronounced in the 2011–2023 timeframe, where the mean CAR declines further to -5.7% and the median to -4.3% . Compared to RTOs, PSIPOs show less skewness in the results, as evidenced by the median values.

The results in Panels A–C suggest that RTOs outperform PSIPOs in the short term. It is worth noting, however, that as Lee et al. (2018) point out, the pre-listing market capitalization of listed RTOs reflects only the shell company's value. Therefore, the initial-day returns represent an increase in enterprise value that are divided between the shell's original owners and the private firm's shareholders. To ensure the robustness of these findings, Panel D conducts difference tests to statistically validate the observed disparities. The first pair compares PIPE-financed RTOs with PSIPOs, where the results consistently reveal statistically significant differences across all short-term event windows (1, 3, 7, and 14 days). This indicates that the returns in Panels A and C indeed differ in a statistically significant way in the short-term market reaction, which contradicts Hypothesis 1 by demonstrating that RTOs perform better than comparable PSIPOs.

A similar pattern of highly significant differences emerges across all the considered event windows in the next comparison, that between Plain RTOs and PSIPOs. However, the comparison between RTOs with PIPE financing and Plain RTOs yields a more complex picture. While the mean differences in CARs are statistically significant at the 5% level for the 3-day window, and at the 1% level for the 1- and 14-day windows, the median differences are not statistically significant across any of the examined short-term windows. This might suggest that the presence of return outliers within these groups affect the mean more substantially than the median.

The results, concerning both mean and median, are significantly smaller than what Lee et al. (2018) observe in their study. This holds true for both the RTO and PSIPO samples. Conversely, the findings also differ from theirs in that this study shows RTOs clearly outperforming PSIPOs, particularly in terms of mean returns, whereas they found no significant difference in the short-term abnormal returns between these listing models.

When interpreting the results presented in Table 3, it is crucial to consider the discrepancy identified in Table 2, where nearly all SPAC transactions in the sample occurred between 2016 and 2023. Furthermore, 93 percent of SPACs fall into the category of PIPE-financed RTOs. Therefore, it is important to examine return differences between SPAC and Shell RTOs. Based on the findings of Floros and Sapp (2011), the performance gap between these transaction types is substantial in favor of Shell RTOs, which may be influencing the results.

Table 4 addresses this issue by separating Shells and SPACs. In Panel A, PIPE-financed Shell RTOs show high CARs throughout all the observed windows, reaching a mean CAR of 35.1% over the 14-day window. The corresponding median CARs remain considerably smaller, indicating, again, a skewed distribution of returns, which suggests that while certain Shell RTOs generate substantial gains, the typical experience is much more modest. On the other hand, PIPE-financed SPACs produce considerably lower CARs. The mean (median) CARs for SPACs remain below 4.3% (1.2%) across all windows, implying that investors tend to react more favorably to Shell RTOs.

Interestingly, Shell RTOs without PIPE financing in Panel B continue to outperform over the short term. This return advantage reverses after a 14-day period, but all returns remain statistically significant at the 1% level. In these RTOs, particularly the first-day returns are notably higher than in the Panel A. Yet, the median CARs for Shell RTOs are very similar to those in the previous panel. SPACs do not achieve statistically significant values but appear to perform even worse than Panel A based on median values.

Table 4. CARs for Shell and SPAC RTO announcements. Panel A presents the CAR of PIPE-financed public target shell and SPAC firms across various event windows. Panel B presents the corresponding results for Plain RTOs. In Panels A and B, T-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively. In Panel C, the mean difference test is based on Welch's t-test and the median difference test is based on the Mann–Whitney U test. P-values lower than 0.01 are denoted as "<0.01".

Panel A: CARs (RTO + PIPE)

Shell		Mean	Median	SPAC		Mean	Median
N	Days	CAR	CAR	N	Days	CAR	CAR
58	(0,+1)	15.3% (6.7875) ***	0.6% (2.0150) **	266	(0,+1)	3.5% (2.5881) ***	1.2% (5.4996) ***
58	(0,+3)	20.8% (1.1710)	2.2% (2.8359) ***	266	(0,+3)	3.8% (6.0313) ***	0.8% (3.6788) ***
58	(0,+7)	22.7% (1.4362)	1.2% (1.7249) *	266	(0,+7)	4.3% (1.9824) **	0.7% (2.8805) ***
58	(0,+14)	35.1% (4.3332) ***	3.9% (2.7106) ***	266	(0,+14)	3.3% (1.1732)	0.6% (2.6588) ***

Panel B: CARs (Plain RTO)

Shell		Mean	Median	SPAC		Mean	Median
N	Days	CAR	CAR	N	Days	CAR	CAR
105	(0,+1)	22.8% (3.6349) ***	1.1% (3.7265) ***	19	(0,+1)	5.6% (1.2108)	-1.6% (0.2395)
105	(0,+3)	27.9% (3.7796) ***	2.3% (3.4657) ***	19	(0,+3)	7.4% (1.5929)	0.5% (1.1976)
105	(0,+7)	27.1% (3.4988) ***	1.0% (2.4869) **	19	(0,+7)	5.7% (1.2011)	-0.2% (0.1960)
105	(0,+14)	33.6% (3.7975) ***	1.0% (2.8284) ***	19	(0,+14)	6.2% (1.2834)	-1.1% (0.3702)

Panel C: Difference test for CARs

Days	Shell RTO + PIPE vs. PSIPO		Plain shell RTO vs. PSIPO		SPAC RTO + PIPE vs. PSIPO		Plain SPAC RTO vs. PSIPO	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
(0,+1)	(0.02)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.12)	(0.38)
(0,+3)	(0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.05)	(0.01)
(0,+7)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.03)	(0.03)
(0,+14)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.03)	(<0.01)	(0.05)	(0.06)

Panel C shows a statistical comparison of these observed results with those of PSIPOs, and the presented p-values indicate highly significant differences in both the mean and median CARs between most RTO types and PSIPOs. Shell RTOs consistently demonstrate statistically significant differences compared to PSIPOs. These differences remain robust across all the examined short-term event windows. In contrast, SPACs, and particularly those without PIPE financing, exhibit a less convincing statistical difference from PSIPOs. For instance, the p-values for the median CAR differences between plain SPAC RTOs and PSIPOs are far from statistically significant in the immediate one-day window and only marginally so over longer periods.

The findings support the results of Floros and Sapp (2011), who observed significantly weaker performance among SPACs, which also holds for PIPE-financed SPACs.

This suggests that SPAC investors anticipate substantially greater skill from SPAC management in identifying an attractive private company, but these expectations are rarely met. Moreover, when considered alongside the findings in Table 3, these results contradict Hypothesis 1, which states that PSIPOs and RTOs should exhibit similar short-term returns. Instead, the findings indicate that RTOs significantly outperform PSIPOs across all event windows and the pattern holds consistently across all subperiods.

5.2 Long-term returns

After the short-term analysis, this study explores whether the returns persist over the long run or turn negative, as suggested by Floros and Sapp (2011). Although RTOs demonstrated stronger short-term performance compared to IPOs, prior research indicates that this trend should reverse over time, with PSIPOs eventually outperforming RTOs, albeit still yielding negative returns (Song et al., 2014; Carpentier et al., 2012).

Table 5 examines BHARs following announcements of PIPE-financed RTOs, plain RTOs, and PSIPOs. Supporting Pavabutr (2019), Panel A indicates that short-term returns do not turn negative in the long term. Instead, PIPE-financed RTOs achieve notable and sta-

tistically significant BHARs. Across the entire sample period (2000–2023), the mean (median) 1-month BHAR stands at 15.5% (1.2%). The results are particularly strong for companies listed between 2000 and 2011, where the mean (median) 1-month BHAR reached 57.7% (14.4%). However, during the 2012–2023 period, the corresponding BHAR drops to 9.9% (0.8%), indicating a considerable decline compared to the earlier period's performance. Returns continue to grow up to the 24-month mark, where the BHAR for the entire sample is 32.5% (13.2%).

Panel B reveals that plain RTOs generate even higher BHAR values, but their distribution is remarkably skewed. Over the entire period, the mean BHAR surges to 130.1% (11.4%) in the first month, but these results are heavily influenced by the 2000–2011 period, during which the mean BHAR is 173.1%. In 2012–2023, the mean BHAR falls to 36.8% (0.6%). A similar trend is observed for other windows. Interestingly, the 12-month BHAR for plain RTOs in 2000–2011 is 103.6%, while the median is –60.3%, highlighting an extreme distribution skew and the dominating influence of individual observations. This phenomenon is also evident in the 24-month returns for the entire period. It should be noted that the skewness remains this strong even though the BHAR data has been winsorized at the 2.5 percentile.

These findings contrast significantly with Duval & Quilliam's (2016) study, which reported a 9.4% mean return over 2 years for PIPE-financed RTOs and a 4.6% return for non-PIPE-financed ones. However, their study may have less extremely high returns that skew the mean. On the other hand, the median returns for PIPE-financed RTOs in this paper only differ from their mean results by about 4 percentage points. Yet, interestingly, the median for plain RTOs in this study is notably weak, even compared to Duval & Quilliam's (2016) average results. While the overall findings are broadly consistent with Pavabutr (2019), this study offers added value through its disaggregation of returns. Pavabutr only reports averages, which may mask skewness and fail to reflect typical investor outcomes.

Panel C demonstrates that PSIPOs do not provide positive long-term returns. The mean and median BHAR values are negative and statistically significant in most cases. For example, in the overall 2000–2023 analysis, the 24-month mean (median) BHAR is –15.2% (–41.2%). An even clearer negative trend is visible in the 2000–2011 period, where the mean BHAR is –36.5% (–39.4%), suggesting systematic underperformance. During the 2012–2023 period, returns are better in terms of the mean, but worse in terms of the median.

The difference in returns between RTOs and PSIPOs appears to be significantly different from what Appadu et al. (2014) found in their study. They reported that RTOs experienced a mean decrease of –17.14% at the 24-month mark. Correspondingly, for IPOs, they found a return of –15.74% at the same point in time. Conversely, it also differs from the discrepancy observed by Lee et al. (2018), where they reported that IPOs generated approximately -20% negative returns within 12 months of listing, while RTO returns remained stable.

Data indicate that a random investment strategy in plain RTOs carries the highest risk of investor loss based on median returns. While a similar observation regarding median returns applies to plain PSIPOs, these do not present the same potential for substantial positive returns, which is evident in the strongly positive mean of plain RTOs. On the other hand, 66.7% of PSIPOs generate positive returns 24 months post-listing, whereas only 26.8% of plain RTOs achieve positive returns over the same horizon. With their positive median returns, PIPE-financed RTOs emerge as the most consistent path toward a positive investment outcome, even though they do not reach statistical significance. A remarkable 70.5% of these lead to positive returns 24 months post-listing, which strongly contradicts Floros & Sapp's (2011) findings that only 10% of RTO companies produce positive returns 18 months post-listing. The findings of this study conflict with Hypothesis 2, while simultaneously providing strong support for Hypothesis 3.

Table 5. BHAR returns for RTO and PSIPO announcements. This table shows the BHAR of RTO + PIPE announcement firms in Panel A. Panel B reports non-PIPE RTO BHARs and Panel C presents PSIPO BHARs. In Panels A-C, T-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively. In Panel D, the mean difference test is based on Welch's t-test and the median difference test is based on the Mann-Whitney U test. P-values lower than 0.01 are denoted as "<0.01".

Panel A: RTO + PIPE BHARs											
2000-2023				2000-2011				2012-2023			
N	Months	Mean BHAR	Median BHAR	N	Months	Mean BHAR	Median BHAR	N	Months	Mean BHAR	Median CAR
324	1	15.5%	1.2%	38	1	57.7%	14.4%	286	1	9.9%	0.8%
		(5.7366) ***	(3.1302)			(4.1213) ***	(3.3428) ***			(4.2207) ***	(1.7306) *
324	3	19.8%	1.8%	38	3	77.8%	33.2%	286	3	12.1%	1.0%
		(6.3028) ***	(2.4688)			(4.8721) ***	(3.4153) ***			(4.4299) ***	(1.1024)
324	6	18.5%	1.8%	38	6	77.5%	20.9%	286	6	10.6%	0.9%
		(5.6660) ***	(2.4593)			(4.8084) ***	(3.2848) ***			(3.6881) ***	(1.2274)
324	12	20.8%	7.6%	38	12	75.5%	12.2%	286	12	13.5%	7.4%
		(6.3803) ***	(5.6144)			(4.5585) ***	(3.2993) ***			(4.7271) ***	(4.8662) ***
292	24	32.5%	13.2%	38	24	88.5%	31.1%	254	24	24.1%	12.7%
		(7.5330) ***	(6.7897)			(4.1961) ***	(2.9947) ***			(6.4738) ***	(6.8190) ***

Panel B: Plain RTO BHARs											
2000-2023				2000-2011				2012-2023			
N	Months	Mean BHAR	Median BHAR	N	Months	Mean BHAR	Median BHAR	N	Months	Mean BHAR	Median BHAR
124	1	130.1%	1.4%	85	1	173.1%	3.1%	39	1	36.3%	-0.6%
		(6.7123) ***	(3.1321) ***			(5.0256) ***	(2.9599) ***			(2.7860) ***	(1.2280)
124	3	160.1%	5.1%	85	3	201.9%	24.6%	39	3	69.0%	3.1%
		(6.5626) ***	(3.9475) ***			(5.2845) ***	(3.6303) ***			(2.2201) **	(2.3584) **
124	6	161.6%	3.8%	85	6	218.5%	11.6%	39	6	37.5%	-1.0%
		(5.8515) ***	(2.3964) **			(4.9436) ***	(2.3596) **			(2.6954) ***	(0.9908)
124	12	107.0%	-3.4%	85	12	150.2%	-5.4%	39	12	12.8%	0.2%
		(5.9477) ***	(0.3915)			(4.2598) ***	(0.9355)			(0.8810)	(-0.4326)
112	24	78.4%	-60.5%	85	24	103.6%	-60.3%	27	24	-0.8%	-62.8%
		(2.6878) ***	(-2.4473) **			(2.5541) **	(-1.6497) *			(0.0691)	(-2.1622) **

(Continued)

Panel C: PSIPO BHARs

2000-2023		Mean	Median	2000-2011		Mean	Median	2012-2023		Mean	Median
N	Months	BHAR	BHAR	N	Months	BHAR	BHAR	N	Months	BHAR	BHAR
131	1	-2.7% (-0.6591)	-2.7% (-3.1955)	27	1	-6.7% (-1.6355)	0.3% (-3.1955)	104	1	-1.7% (-0.3205)	-3.6% (-3.1553)

131	3	10.8% (1.5766)	-7.7% (-2.5224)	27	3	11.9% (1.2461)	1.4% (-2.5224)	104	3	10.5% (1.2750)	-9.5% (-3.0126)

131	6	7.1% (0.8525)	-11.2% (-2.9910)	27	6	-8.0% (-0.6948)	-11.2% (-2.9910)	104	6	11.0% (1.0939)	-11.2% (-2.5683)
											**
130	12	11.2% (0.8806)	-24.5% (-3.4913)	27	12	-7.3% (-0.5408)	-14.1% (-3.4913)	103	12	16.0% (1.0240)	-27.2% (-3.5282)

124	24	-15.2% (-0.9134)	-41.2% (-5.3290)	27	24	-36.5% (-2.0820)	-39.4% (-5.3290)	97	24	-9.2% (-0.4486)	-41.6% (-4.7767)

Panel D: Difference test for BHARs

Months	RTO + PIPE vs. PSIPO		Plain RTO vs. PSIPO		RTO + PIPE vs. Plain RTO	
	Mean	Median	Mean	Median	Mean	Median
1	(0.28)	(<0.01)	(0.06)	(<0.01)	(0.93)	(0.21)
3	(0.61)	(<0.01)	(0.05)	(<0.01)	(0.11)	(0.03)
6	(0.51)	(<0.01)	(0.04)	(<0.01)	(0.14)	(0.59)
12	(0.64)	(<0.01)	(0.16)	(0.06)	(0.22)	(0,02)
24	(0.11)	(<0.01)	(0.13)	(0.41)	(0.83)	(<0.01)

The statistical differences reported in Panel D support the earlier observations. Based on median values, PIPE-financed RTOs differ from PSIPOs at a statistically significant 1% level across all timeframes. The mean values do not show statistically significant deviations in any column, except for the initial months of plain RTOs. Interestingly, the results comparing Panels A and B show weak statistical significance, with the exception of the 3-month and 24-month BHAR returns.

As with short-term returns, shell and SPAC RTOs are also differentiated in long-term returns to allow for sufficiently reliable analysis. Table 6 focuses on BHAR returns following RTO announcements, distinguishing between these two key RTO models. Panel A shows that PIPE-financed Shell RTOs consistently generate positive and statistically significant BHAR values across all examined time periods. The mean (median) BHAR values increase from 63.4% (6.8%) at one month to as high as 97.1% (10.7%) over the 24-month review period. Although median BHAR values remain more modest, the results still indicate that positive returns are not solely the result of a few exceptional cases. In Panel A, SPACs produce significantly lower BHAR values. For example, in the first month, the mean (median) BHAR is 5.0% (0.8%), while at 24 months, it is 16.8% (13.3%). Consequently, statistical significance also remains lower for median returns, especially in the first months.

Panel B highlights the exceptionally high mean BHAR returns for plain shells. For instance, over the six-month period, the mean (median) BHAR is 189.8% (7.9%) and at 24 months, it is 91.4% (-62.8%). However, these figures are driven by a skewed distribution, which is particularly evident at 24 months, where the median turns negative, differing clearly from the mean. This result suggests significant dispersion, with individual successes driving the mean exceptionally high, while the majority of investors experience weak or even negative returns. For plain SPACs, BHAR returns remain low, and especially at 24 months, both the mean and median are negative: -40.5% and -37.6%. However, these results are not statistically significant. The poor long-term performance of SPACs could be attributed to the fact that, unlike shell companies where management changes in 95% of RTO transactions, this only occurs in 44% of SPACs, according to Floros and Sapp's (2011) findings.

Table 6. BHARs for RTO announcements. Panel A presents the BHARs of PIPE-financed public target shell and SPAC firms across various event windows. Panel B presents the corresponding results for Plain RTOs. In Panels A and B, T-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively. In Panel C, the mean difference test is based on Welch's t-test and the median difference test is based on the Mann–Whitney U test. P-values lower than 0.01 are denoted as "<0.01".

Panel A: RTO+PIPE BHARs

Shell N	Months	Mean BHAR	Median BHAR	SPAC N	Months	Mean BHAR	Median BHAR
58	1	63.4% (4.7650)	6.8% (3.2557)	266	1	5.0% (3.8780)	0.8% (1.7306)
		***	***			***	*
58	3	78.1% (5.2409)	11.6% (3.1782)	266	3	7.1% (3.8828)	1.1% (1.1024)
		***	***			***	
58	6	76.5% (5.0162)	7.3% (2.9227)	266	6	5.8% (2.9446)	1.0% (1.2274)
		***	***			***	
58	12	76.4% (4.8713)	9.4% (3.2015)	266	12	8.7% (4.4131)	7.5% (4.8662)
		***	***			***	***
57	24	97.1% (4.4654)	10.7% (2.0866)	235	24	16.8% (8.5695)	13.3% (6.8190)
		***	**			***	***

Panel B: Plain RTO BHARs

Shell N	Months	Mean BHAR	Median Months	SPAC N	Months	Mean BHAR	Median Months
105	1	152.5% (5.4231)	3.7% (3.4414)	19	1	6.2% (1.4321)	-2.6% (-0.4024)
		***	***				
105	3	188.8% (5.6790)	24.1% (4.2406)	19	3	1.5% (0.5611)	1.4% (-0.6036)
		***	***				
105	6	189.8% (5.3072)	7.9% (2.5750)	19	6	5.5% (1.4978)	-1.3% (0.0000)
		***	**				
105	12	126.3% (4.3486)	-5.1% (0.6985)	19	12	0.1% (0.0776)	-1.9% (-0.8451)

101	24	91.4% (2.5966)	-62.8% (-2.0072)	11	24	-40.5% (-0.8721)	-37.6% (-1.6004)
		***	**				

Panel C: Difference test for BHARs

Months	Shell RTO + PIPE vs. PSIPO		Plain shell RTO vs. PSIPO		SPAC RTO + PIPE vs. PSIPO		Plain SPAC RTO vs. PSIPO	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1	(0.17)	(<0.01)	(0.04)	(<0.01)	(0.44)	(<0.01)	(0.46)	(0.23)
3	(0.11)	(<0.01)	(0.03)	(<0.01)	(0.30)	(<0.01)	(0.25)	(0.11)
6	(0.10)	(<0.01)	(0.02)	(<0.01)	(0.34)	(<0.01)	(0.34)	(0.03)
12	(0.11)	(<0.01)	(0.14)	(0.10)	(0.29)	(<0.01)	(0.23)	(0.12)
24	(0.08)	(<0.01)	(0.10)	(0.39)	(0.77)	(<0.01)	(0.19)	(0.88)

Consistent with their conclusions, SPAC managers do not add value through their continued presence in the post-listing firm.

Panel C further performs a difference test for the observed results, for both the mean and the median. Interestingly, the results show that PIPE-financed Shell RTOs achieve statistically significant results at the 1% level for the median. In addition, for the mean, PIPE-financed shells achieve significant results at the 10% level for the 24-month period, unlike comparable SPACs. Plain shells achieve significant results for both the mean and the median for the first three time windows. Furthermore, the comparison of returns between PIPE-financed and non-PIPE-financed RTOs yields statistically significant values for the median at both 12 and 24 months.

The findings in Table 6 support the hypothesis 3 that overall, PIPE-financed RTOs perform better than those that are not. If a company does not raise PIPE financing at the time of listing, the returns may be weaker than those of PSIPOs. This reinforces Lee et al.'s (2018) conclusion that PIPE financing is a leading indicator of RTO success and is of interest to investors. Early participation by PIPE investors in an RTO acts as a monitoring mechanism or a quality control indicator.

However, as seen from the mean in Table 6, there are extreme exceptions that skew the mean results. These results contradict Hypothesis 2, which stated that RTO and PSIPO returns would correspond to each other in the long term. Instead, it shows that RTOs may offer extremely strong long-term returns. This suggests that investors do not perceive the information asymmetry or regulatory shortcomings associated with RTOs as problematic, unlike what Carpentier et al. (2012) observe in their study.

5.3 Operational development

As the final part of the results section, this thesis turns to operational performance to complement the findings on stock price behavior. While abnormal returns and long-term

buy-and-hold performance reflect how investors and markets respond to RTOs, they reveal little about the firms' underlying operational fundamentals. To address this, a set of key financial ratios is examined around the RTO announcement to evaluate whether these transactions are associated with meaningful changes in firm operations.

Table 7 summarizes the mean and median changes in a range of financial indicators including profitability, liquidity, leverage, and investment activity over a four-year window surrounding the transaction. Panel A presents the operational performance of PIPE-financed RTOs from year $t-1$ to $t+2$. The first box of Panel A focuses on ROA which shows persistently negative values throughout the observation window. Despite some improvements immediately following the transaction, such as an 18.46 percentage point increase in the $(0,+1)$ period, the changes are not statistically significant, indicating that RTOs that have raised PIPE financing do not succeed in turning their business profitable even within 2 years of the announcement date.

In contrast, liquidity ratios, particularly the Quick Ratio and Current Ratio, show statistically significant increases⁴¹ in the period leading up to the RTO announcement. This likely indicates that the cash from PIPE investors helps the company's short-term financial situation. However, this change is not persistent, as the mean ratios decline below their initial values by the two-year mark, potentially indicating that the financing provides only a temporary buffer for the companies.

Regarding capital structure, the Debt to Total Assets Ratio shows a statistically significant decrease in the $(-1,+1)$ and $(-1,+2)$ periods, particularly in the median values. This implies that PIPE financing may be used as a vehicle to deleverage, or that the infusion of equity capital reduces relative debt levels. Interestingly, Sales to Total Assets and Capex to Total Assets both decline after the transaction. The median Capex ratio shows a statistically significant drop across several periods, particularly in $(-1,+2)$, where the result is significant at the 5% level. Declining revenue likely indicates that the business operations of RTO firms are not on a stable footing. Capex is 6.4% in the year prior to listing

⁴¹ For instance, the mean (median) Quick Ratio rises from 4.0 (1.30) to 8.7 (2.16) in the $(-1, 0)$ window, with changes statistically significant at the 1% level.

Table 7. Operational performance surrounding RTO announcements. This table presents changes in various performance metrics surrounding the announcement of RTOs. The table reports mean and median values for key financial indicators across years -1 to +2 relative to the announcement. For each metric, changes over multiple windows ([-1,0], [0,+1], [-1,+1], [-1,+2]) are calculated. Statistical significance is assessed using both parametric mean, p-value and non-parametric Wilcoxon signed-rank tests. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

Panel A: RTO + PIPE operational performance													
Return on assets surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	-41.25	-90.19	-71.73	-53.38	Change	-48.94	18.46	-30.48	-12.13				
Median	-28.07	-26.97	-27.29	-26.55	p value	0.56	0.41	0.73	0.89				
N	115	115	115	115	Wilcoxon	0.39	0.06	*	0.21	0.07	*		
					p value								
Quick Ratio surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	4.02	8.65	5.01	3.90	Change	4.63	-3.64	0.98	-0.12				
Median	1.30	2.16	2.13	1.89	p value	0.00	***	0.00	***	0.07	*	0.82	
N	175	175	175	175	Wilcoxon	0.00	***	0.00	***	0.00	***	0.08	*
					p value								
Cash to total assets surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	28.7	40.5	31.3	27.9	Change	11.7	-9.1	2.6	-0.8				
Median	19.2	34.7	24.4	21.0	p value	0.56	0.41	0.73	0.89				
N	174	174	174	174	Wilcoxon	0.00	***	0.00	***	0.13	0.96		
					p value								
Debt to total assets surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	63.7	59.9	41.8	42.7	Change	-3.9	-18.1	-22.0	-21.1				
Median	45.5	40.5	35.2	36.8	p value	0.74	0.11	0.02	**	0.02	**		
N	81	81	81	81	Wilcoxon	0.08	*	0.11	0.00	***	0.01	**	
					p value								
Sales to total assets surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	0.93	0.60	0.59	0.72	Change	-0.33	-0.01	-0.34	-0.21				
Median	0.63	0.41	0.35	0.45	p value	0.00	***	0.76	0.00	***	0.02	**	
N	112	112	112	112	Wilcoxon	0.00	***	0.33	0.00	***	0.06	*	
					p value								
Current ratio surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	4.34	8.83	5.43	4.26	Change	4.48	-3.39	1.09	-0.08				
Median	1.58	2.42	2.70	2.46	p value	0.00	***	0.00	***	0.05	**	0.87	
N	185	185	185	185	Wilcoxon	0.00	***	0.01	***	0.00	***	0.04	**
					p value								
Cash ratio surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	61.8	61.1	49.4	46.3	Change	-0.7	-11.7	-12.4	-15.5				
Median	69.7	68.1	45.9	42.0	p value	0.80	0.00	***	0.00	***	0.00	***	
N	169	169	169	169	Wilcoxon	0.13	0.00	***	0.00	***	0.00	***	
					p value								
Capex on total assets surrounding the announcement of PIPE financed RTO													
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)				
Average	6.4	4.3	4.6	4.4	Change	-2.1	0.2	-1.8	-2.0				
Median	2.5	1.6	2.1	2.1	p value	0.01	***	0.74	0.07	*	0.03	**	
N	129	129	129	129	Wilcoxon	0.00	***	0.12	0.26	0.05	**		
					p value								

(Continues)

Panel B: Plain RTO operational performance

Return on assets surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	2685.7	-2159.7	-7030.9	-614.07	Change	-4845.4	-4871.3	-9716.7	-3299.8
Median	-29.47	-110.75	-82.03	-63.79	p value	0.23	0.48	0.20	0.38
N	29	29	29	29	Wilcoxon	0.84	0.91	0.54	0.97
					p value				
Quick Ratio surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	2.12	1.71	1.05	1.34	Change	-0.41	-0.66	-1.07	-0.78
Median	0.79	0.85	0.58	0.52	p value	0.59	0.09	*	0.13
N	27	27	27	27	Wilcoxon	0.02	**	0.12	0.27
					p value				
Cash to total assets surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	58.70	31.26	32.05	23.88	Change	-27.43	0.79	-26.65	-34.82
Median	78.18	16.98	15.70	10.33	p value	0.23	0.48	0.20	0.38
N	18	18	18	18	Wilcoxon	0.00	***	0.03	**
					p value			0.00	***
								0.01	**
Debt to total assets surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	156.34	116.64	186.86	199.80	Change	-39.70	70.22	30.52	43.46
Median	86.62	43.46	41.10	37.00	p value	0.56	0.26	0.76	0.57
N	13	13	13	13	Wilcoxon	0.42	0.92	0.75	0.97
					p value				
Sales to total assets surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	2.17	1.37	2.21	1.00	Change	-0.79	0.83	0.04	-1.17
Median	1.28	1.09	1.22	0.65	p value	0.16	0.17	0.96	0.07
N	17	17	17	17	Wilcoxon	0.12	0.09	*	0.69
					p value			0.01	***
Current ratio surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	0.01	0.00	0.00	0.00	Change	-0.02	0.00	-0.02	-0.02
Median	0.00	0.00	0.00	0.00	p value	0.19	0.08	*	0.18
N	27	27	27	27	Wilcoxon	0.21	0.00	***	0.01
					p value			***	0.02
									**
Cash ratio surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	390.07	58.48	36.93	27.41	Change	-331.59	-21.56	-353.14	-362.66
Median	38.15	35.29	13.16	11.33	p value	0.07	*	0.09	*
N	17	17	17	17	Wilcoxon	0.12	0.12	0.03	**
					p value			0.01	***
									**
Capex on total assets surrounding the announcement of plain RTO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	13.68	6.42	10.00	5.31	Change	-7.26	3.58	-3.67	-8.36
Median	6.54	3.91	4.12	2.72	p value	0.14	0.30	0.56	0.17
N	17	17	17	17	Wilcoxon	0.12	0.38	0.62	0.33
					p value				

but decreases post-listing, suggesting that PIPE funding is not being invested into the business. This is an interesting observation given that Floros and Sapp (2011) show many RTOs operate in industries requiring substantial R&D investments. Furthermore, the cash

to total-assets ratio shows that cash is also not being accumulated on the balance sheet over time.

In Panel B, ROA remains negative throughout the examined period, suggesting persistent unprofitability among plain RTO firms. While the mean ROA improves slightly after the announcement, none of the changes are statistically significant, indicating no systematic improvement in profitability. Furthermore, the variance of ROA in the data is very high, and overall, the results are strongly negative post-listing. These results differ from those of PIPE-financed RTOs in terms of the weakness of ROA and its very poor development.

Liquidity metrics offer mixed signals. The Quick Ratio shows a decline over time, with the median decreasing from 0.85 at year 0 to 0.52 by year 2. Notably, the data suggests significant deterioration in liquidity in the $(-1, 0)$ period, unlike in PIPE-backed RTOs where short-term liquidity tends to strengthen in the announcement year. Similarly, the Cash to Total Assets ratio declines sharply in the median, with statistically significant changes in several windows suggesting that cash buffers shrink post-announcement. Interestingly, both the quick and current ratios are already significantly higher in Panel A compared to Panel B prior to the transaction. The gap widens further following the PIPE financing.

In terms of leverage level, Debt to Total Assets is considerably higher for non-PIPE-financed companies and increases throughout the period, in contrast to PIPE-financed RTOs where leverage tends to decrease, likely due to the PIPE financing. A similar picture emerges for the Sales to Total Assets ratio, which declines consistently after the announcement with statistically significant median drops in longer windows such as $(-1, +2)$. The Current Ratio and Cash Ratio in Panel B exhibit consistent declines after the RTO, with the Wilcoxon test showing strong significance in later windows. As expected, these mirror those of the Quick Ratio, reinforcing the interpretation that liquidity worsens over time. Capex to Total Assets remains low and shows no meaningful increase post-transaction.

The findings suggest that unlike PIPE-financed RTOs, plain RTOs are less likely to experience operational strengthening post-announcement. Instead, the metrics often deteriorate, explaining why PIPE-financed RTOs tend to perform better in the long run, at least in terms of the median values. Nevertheless, neither panel provides evidence of substantial improvement in operational performance, as indicated by profitability remaining negative even two years post-listing and revenue failing to increase. The weak ROA profitability and elevated indebtedness of Panel A are consistent with Andriosopoulos & Panetsidou's (2021) PIPE performance study.

The results are notably weaker than those reported in Dasilas et al. (2016), who document a positive median ROA for each year spanning the same interval of (-1, +2) relative to the announcement. Their research also indicates a positive development in profitability after to the RTO, which contrasts with the observations of this paper. Similarly, Gleason et al. (2005) report improved profitability for RTO firms, albeit not turning positive within two years post-listing. Both studies document considerably lower levels of indebtedness, as evidenced by the debt to total-assets metric. Conversely, the quick ratio and current ratio reported by Dasilas et al. (2016) align with those observed for PIPE-financed RTOs in this analysis. Regarding revenue development, their results fall between the trends identified for PIPE-financed and non-PIPE-financed RTOs in the current study.

Table 8 presents the operational performance surrounding PSIPO announcements. Firstly, a clear upward trend in ROA draws attention following these listings. The mean ROA increased steadily from -517.74 one year prior to -88.74 by the second-year post-announcement. This positive shift is particularly pronounced over longer event windows, especially (-1,+1) and (-1,+2). Conversely, the negative development of the median values indicates that strong positive growth occurs in only a handful of companies, and in reality, the data closely resembles that of RTOs.

Liquidity indicators also demonstrate improvement following PSIPO announcements. The Quick Ratio exhibits a marked increase in both mean and median values from year

Table 8. Operational performance surrounding PSIPO announcements. This table presents changes in various performance metrics surrounding the PSIPO announcement. The table reports mean and median values for key financial indicators across years -1 to +2 relative to the announcement. For each metric, changes over multiple windows ([-1,0], [0,+1], [-1,+1], [-1,+2]) are calculated. Statistical significance is assessed using both parametric mean, p-value and non-parametric Wilcoxon signed-rank tests. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

Return on assets surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	-517.74	-500.34	-97.99	-88.74	Change	17.40	402.35	419.74	429.00
Median	-39.76	-37.90	-36.64	-51.12	pvalue	0.94	0.16	0.04	** 0.08 *
N	116	116	116	116	Wilcoxon	0.06	* 0.08 *	0.00	*** 0.09 *
pvalue									
Quick Ratio surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	3.63	8.05	5.91	4.46	Change	4.41	-2.14	2.28	0.83
Median	0.93	1.77	2.78	1.46	pvalue	0.00	*** 0.07 *	0.00	*** 0.19
N	110	110	110	110	Wilcoxon	0.00	*** 0.08 *	0.00	*** 0.03 **
pvalue									
Cash to total assets surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	44.60	52.22	48.67	42.66	Change	7.62	-3.55	4.07	-1.94
Median	37.75	54.34	45.13	33.09	pvalue	0.94	0.16	0.04	** 0.08 *
N	114	114	114	114	Wilcoxon	0.03	** 0.07 *	0.31	0.70
pvalue									
Debt to total assets surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	88.7392	61.7829	180.806	1508.41	Change	-26.96	119.02	92.07	1419.7
Median	26.62	15.67	14.94	17.10	pvalue	0.24	0.15	0.33	0.33
N	79	79	79	79	Wilcoxon	0.00	*** 0.12	0.09	* 0.03 **
pvalue									
Sales to total assets surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	1.56	0.69	0.66	0.80	Change	-0.87	-0.03	-0.90	-0.76
Median	0.40	0.19	0.24	0.26	pvalue	0.06	* 0.59	0.05	* 0.10 *
N	110	110	110	110	Wilcoxon	0.00	*** 0.90	0.00	*** 0.11
pvalue									
Current ratio surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	3.67	8.29	6.79	5.04	Change	4.72	-1.94	2.78	1.23
Median	1.16	2.71	3.03	1.82	pvalue	0.00	*** 0.11	0.00	*** 0.11
N	126	126	126	126	Wilcoxon	0.00	*** 0.15	0.00	*** 0.04 **
pvalue									
Cash ratio surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	318.659	761.20	574.144	422.835	Change	442.537	-187.05	255.485	104.176
Median	40.18	154.25	185.89	78.28	pvalue	0.00	*** 0.16	0.01	*** 0.18
N	108	108	108	108	Wilcoxon	0.00	*** 0.08 *	0.00	*** 0.03 **
pvalue									
Capex on total assets surrounding the announcement of PSIPO									
Years	-1	0	1	2	Period	(-1, 0)	(0, +1)	(-1, +1)	(-1, +2)
Average	3.27	2.44	3.19	2.85	Change	-0.83	0.75	-0.08	-0.42
Median	0.68	0.52	0.66	0.60	pvalue	0.21	0.28	0.92	0.64
N	108	108	108	108	Wilcoxon	0.03	** 0.28	0.44	0.38
pvalue									

-1 to 0, with these significant changes persisting across longer event windows, as supported by both statistical tests. The Cash to Total Assets ratio maintains relative stability,

displaying only modest fluctuations. These results are consistent with PIPE-financed RTOs, which also receive a capital injection at the time of the listing. However, the Debt to Total Assets ratio shows an increase after PSIPO announcements, particularly in the mean values, suggesting a rise in leverage. This pattern stands in contrast to PIPE-backed RTOs, where a reduction in leverage is more typical.

As in both RTO panels, Sales to Total Assets shows no signs of improvement for PSIPOs either. Statistically significant declines are observed in the Wilcoxon test across several periods. Capex to Total Assets follows a similar pattern to that seen in RTOs, showing no upward trend after the listing and yielding no statistically significant results. The findings indicate that, based on ROA, there are no substantial differences in performance between PSIPOs and RTOs. Sales to Total Assets declines the least for PIPE-financed RTOs over the same period. Liquidity indicators consistently suggest stronger post-announcement improvement for PSIPOs, but these firms also exhibit a greater increase in leverage compared to RTOs.

The results deviate from Lee et al.'s (2018) observed growth in both sales and profitability. While sales for U.S. PSIPOs and RTO firms in this study decline, Lee et al.'s sample of Chinese firms shows significant growth in both listing models. The same phenomenon is evident in profitability across both listing models. Furthermore, unlike their findings, this study does not observe significantly superior operational performance for RTOs compared to IPOs. Overall, due to the mixed evidence in various metrics, the results do not provide sufficient support that either RTOs or PSIPOs significantly outperform the other operationally. These findings support the interpretation that RTOs are not inherently weak compared to IPOs. Rather, small publicly listed firms tend to face operational challenges regardless of their listing method. Therefore, the data supports Hypothesis 4.

Lastly, table 9 presents regression results that explore the short- and long-term performance implications of RTOs and PSIPOs. The dependent variables are CARs over 14 days in Panel A and BHARs over 12 months in Panel B. Each panel is divided into two subpanels for RTO and PSIPO firms, with two model specifications reported for each.

The results in Panel A suggest that firm size, measured as the natural logarithm of assets, is positively related to short-term abnormal returns in both RTOs and PSIPOs, but the relationship is statistically significant only in the case of PSIPOs. The coefficients for PSIPOs are approximately 0.18 with significance at the 1% level, indicating that larger firms benefit more from short-term market reactions when entering public markets via an IPO. EBITDA relative to assets⁴² also appears to drive short-term returns in PSIPOs, with a strong positive effect that is highly significant, suggesting that more profitable firms are rewarded by investors shortly after listing. Interestingly, the interaction term between EBITDA and firm size is negative and statistically significant, implying diminishing marginal returns to profitability as firm size increases.

Capital expenditures relative to assets are positively and significantly associated with short-term returns in both RTO and PSIPO samples, with coefficients around 0.52 and significance at the 5% level. This suggests that investors perceive capital investment as a positive signal of future growth prospects. Furthermore, as expected, the shell dummy appears to have a positive and statistically significant effect at the 5% level on RTO returns, which is consistent with the findings of the previous tables.

Panel B reveals more distinct differences in long-term performance between RTO and PSIPO firms. For PSIPOs, profitability is again a key driver. EBITDA relative to assets has a very large positive coefficient, above 23, and is statistically significant at the 1% level, showing that highly profitable firms enjoy markedly better 12-month abnormal returns. However, the negative and significant interaction between EBITDA and firm size persists, reinforcing the observation that smaller profitable firms tend to perform better in the long run.

In the RTO sample, long-term performance appears to be driven more by structural and financing factors than by profitability. The dummy variables for PIPE financing and shell status are both strongly positive and statistically significant, with coefficients above 2.3

⁴² EBITDA is used as a profitability measure instead of ROA due to data availability issues.

and 2.4, respectively. These findings, again, imply that RTO firms with PIPE financing perform significantly better over the long term, supporting the observations of Duval and Quilliam (2016). In addition, Shell RTOs appear to have even stronger influence on long-term returns than short term, as the coefficient rises to 2.3 in 12-month period. On the contrary, capital expenditures are negatively associated with long-term performance in RTOs, with a coefficient of roughly -5.4 and significance at the 5% level, suggesting that heavy investment may not yield expected returns and could reflect inefficient capital use.⁴³ Debt relative to assets exhibits contrasting effects across the two listing types. For PSIPOs, high leverage is associated with significantly worse long-term returns, with a coefficient of around -3 , while for RTOs, the effect is positive and statistically significant.

The results in table 9 shows that the PSIPOs benefit more from firm-level fundamentals such as profitability and size, while RTO outcomes appear to depend heavily on structural and deal-specific factors like shell characteristics and PIPE financing, supporting the Hypothesis 3. These results contrast with the extent to which stock price movement around the listing is driven by financial performance, particularly for RTOs.

⁴³ This could also be an industry-specific factor, where capital or R&D-heavy industries negatively affect returns.

Table 9. Stock performance to RTO and PSIPO announcements. This table presents regression results for CARs over 14 days and BHARs over 12 months following RTO and PSIPO announcements. Panel A shows short-term reactions and Panel B reports long-term performance. Models include firm characteristics and transaction-related controls. P-values are reported in parentheses. P-values lower than 0.01 are denoted as "<0.01". Statistical significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	Panel A: CAR 14 days				Panel B: BHAR 12kk			
	RTO		PSIPO		RTO		PSIPO	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Ln (assets)	0.05 (0.11)	0.05 (0.11)	0.18 (0.01) ***	0.18 (<0.01) ***	-0.39 (0.28)	-0.37 (0.30)	0.24 (0.65)	0.24 (0.63)
Debt/assets	-0.03 (0.38)	-0.03 (0.38)	-0.10 (0.20)	-0.10 (0.17)	1.16 (0.01) ***	1.14 (0.01) ***	-2.99 (<0.01) ***	-2.99 (<0.01) ***
Revenue/assets	0.03 (0.19)	0.03 (0.19)	-0.03 (0.08) *	-0.03 (0.07) *	-0.28 (0.25)	-0.27 (0.26)	0.29 (0.06) *	0.29 (0.06) *
EBITDA/assets	0.00 (0.57)	0.00 (0.56)	1.88 (<0.01) ***	1.88 (<0.01) ***	-0.12 (0.49)	-0.05 (0.34)	23.27 (<0.01) ***	23.27 (<0.01) ***
Dummy for high-tech industry	0.20 (0.12)	0.20 (0.12)	0.21 (0.11)	0.21 (0.11)	-0.30 (0.82)	-0.38 (0.78)	0.81 (0.44)	0.81 (0.43)
EBITDA x Ln (assets)	0.00 (0.57)	0.00 (0.56)	-0.44 (<0.01) ***	-0.44 (<0.01) ***	0.03 (0.67)		-5.45 (<0.01)	-5.45 (<0.01)
Capex/assets	0.52 (0.99) **	0.52 (0.99) **			-5.40 (0.62) **	-5.45 (0.60) **		
Dummy for sponsor backing	0.00 (0.30)		-0.02		-0.26 (0.01)	-0.27 (0.01)	0.00	
Dummy for PIPE	-0.08 (0.01)	-0.08 (0.01)			2.34 (0.01) ***	2.30 (0.01) ***		
Dummy for Shell	0.20 (0.02) **	0.20 (0.02) **			2.40 (0.04) ***	2.44 (0.03) ***		

6 Conclusions

RTOs have gained popularity as an alternative listing method, particularly among smaller firms seeking faster access to public markets. However, these transactions can be difficult for private investors to interpret, and the phenomenon has received limited academic attention. This limited understanding, combined with frauds associated with these structures, has reinforced the negative perception of RTOs, often characterizing them as vehicles for information-asymmetric, small, and unprofitable companies seeking public listing (Floros & Shastri, 2009; Carpentier et al., 2012).

In light of these observations, this study adopts a novel approach to address identified gaps in previous research. First, as demonstrated by Appadu et al. (2014) and Song et al. (2014), post-RTO returns must be contextualized to be meaningfully interpreted. Therefore, RTOs are compared to traditional IPOs, but specifically to small ones in this study, as these best match the characteristics of RTO companies. Secondly, this thesis addresses another issue raised by Sjostrom (2008), namely that RTOs do not receive a capital injection at the time of listing, which reduces their comparability to IPOs. Following the study by Duval and Quilliam (2016), PIPE-financed RTOs are considered separately to ensure comparability. Finally, the study accounts for Floros & Sapp's (2011) findings, particularly regarding the return differences between SPACs and Shell RTOs and thus segregates the results for these methods to enhance validation of the findings.

Thereby, this new research approach seeks to provide more developed answers to support the existing literature. Additionally, the study ensures 'apples-to-apples' comparability by examining the financial performance of both listing models, following the research of Dasilas et al., (2016). This is also important because if one method significantly outperformed the other operationally, then better stock price performance would reasonably be expected from that group. Finally, the study regresses operational and qualitative variables with both short-term and long-term performance. The purpose of this is to demonstrate which factors from the study's data are most central in driving the returns of these listing models.

Analysis of short-term CAR returns reveals superior performance for RTOs compared to PSIPOs, and no underpricing is evident in the PSIPO sample, as returns are negative in all short-term periods (the 7-day mean return is -7.1%). While RTOs do not consistently yield significant positive returns, the strongest short-term gains are found in the non-PIPE-financed group, especially when SPACs are excluded and the focus is narrowed to Shell RTOs (the 7-day mean return is 27.1%). Collectively, these short-term findings contradict Hypothesis 1's assumption that RTO and PSIPO returns would be aligned. The finding regarding RTO returns aligns with prior literature but does not support previous IPO literature on positive short-term returns. The findings indicate that investors do not perceive RTOs as an inferior listing alternative, nor does the inherent information asymmetry appear to be a significant concern within the U.S. market. Moreover, investors may interpret RTOs as a 'lifeline' for certain firms, substantially boosting the stock price of what might have been a previously underperforming shell company. This perception can, in specific instances, precipitate irrationally speculative investor behavior.

Moving to long-term performance, and contrary to Dasilas et al. (2016), Carpentier et al. (2012), Appadu et al. (2014), and Song et al. (2014) demonstrate, this study finds that the long-term return difference presents a more complex picture and does not unequivocally support superior PSIPO returns. As BHAR returns contain significant data skewness from individual extreme returns, the conclusions particularly focus on their median values. Interestingly, these median values reveal that PSIPOs yield significantly negative returns of -41.2% over a 24-month period, whereas PIPE-financed RTOs generate a positive return of 13.2% , supporting Pavabutr's (2019) findings on the sustainability of RTO returns. Notably, RTOs that do not secure PIPE financing perform even worse than PSIPOs, incurring a -60.5% negative return. This, combined with the short-term results, supports Carpentier et al.'s (2012) behavioral theory of RTO pricing, which suggests that investors initially irrationally overvalue the combined entity's fair value, leading to stock price declines in the long run. Together, these results disconfirm Hypothesis 2.

Regarding operational performance, PIPE-financed RTOs generally exhibit superior profitability compared to their non-PIPE-financed counterparts. However, based on this study's findings, no unambiguous conclusion can be drawn regarding operational efficiency improvements, even with the injection of new capital. Instead, new capital seems to provide companies only a temporary liquidity boost that rapidly diminishes over the years due to persistent weak profitability. Conversely, the results supporting Hypothesis 4 suggest that the compared groups are indeed operationally comparable, thus validating the earlier stock price findings. Finally, for RTOs, it is evident that 12-month stock price data is predominantly influenced by PIPE and Shell dummy variables, rather than underlying operational metrics. This reinforces earlier observations of superior returns for these specific RTO types relative to others, thus confirming Hypothesis 3.

To conclude, this thesis's findings have several implications. First, it shows that RTOs serve as viable alternatives to traditional IPO listings, particularly for smaller companies. Second, it demonstrates to investors that RTO companies can generate significantly positive returns, which are generally superior to those of comparable IPOs. Simultaneously, the observations highlight the substantial impact of PIPE financing, especially on long-term returns, as these RTOs clearly outperform other counterparts.

The results also indicate that investors are often dissatisfied with mergers involving so-called one-off 'private equity investments', specifically, SPACs, as the data reveals that among RTOs, SPACs perform considerably worse than shell companies. Finally, the results confirm previous research findings regarding the financially unstable state of RTO companies' operational performance. The data also supports that listing does not change this situation during the four-year observation period, a consistent observation across both RTOs and PSIPOs.

These findings provide tools for corporate management on how to utilize RTOs, especially given the currently closed IPO window and less frequent listings compared to 2021. For future research, it would be beneficial to expand this study to better understand PIPE

financing utilized by RTO companies and its impact on performance. Specifically, it would be important to investigate the potential differences between traditional and structured PIPE financing within the RTO context. Additionally, performance analysis could be broadened by examining a third RTO category, synergy RTOs, thereby deepening Appadu et al.'s (2014) conceptualization of this term, for instance, in relation to the industry or geographical congruence of merging entities. Finally, the methodology used in this study would be extremely useful to apply in other regulatory regions, as regulations can differ significantly from the SEC's in the U.S.

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