The determinants and effectiveness of reverse takeovers in the U.K.

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Abstract

Using a sample of reverse takeovers (RTOs) in the U.K., we find private firms seeking exchange listing tend to choose RTO instead of IPO in poor market conditions. Related, RTO firms do not hoard cash out of capital raised as IPO firms often do. Compared to IPO firms, RTO firms spend less capital raised on paying dividend and retiring debt. They are not, however, much different from IPO firms in terms of post-listing business expansion, access to external equity market or operating performance. Overall, our evidence suggest that U.K. firms strategically time their RTO listings and RTOs do not introduce inferior listings.

1 Introduction

In a reverse takeover (RTO), a public firm acquires a private firm. Unlike in an ordinary takeover, the private firm's shareholders take majority control of the enlarged firm post transac-

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tion and the private firm's business constitute the main part of the enlarged firm.[1]

A common misconception about RTO is that it is only an expedient and cost efficient substitute to Initial Public Offering (IPO). Previous studies predominantly focus on RTOs in the U.S. and authors find that RTO firms are usually younger, smaller, more financially constrained, less profitable and less transparent (Adjei et al. 2008, Arellano Ostoa and Brusco 2002, Bayar and Chemmanur 2006, Gleason et al. 2005); post RTO, private firms obtain initial listings mostly on either Over-The-Counter Bulletin Board (OTCBB) or pink sheets (Gleason et al. 2005, Lee, Li and Zhang 2014); they are more likely to de-list post listing (Gleason et al. 2005, Adjei et al. 2008, Arellano-Ostoa and Sandro, 2002); and there is no clear evidence of performance improvement of RTO firms (Gleason et al. 2005).[2] These observations are not surprising, considering that OTCBB and Pink Sheets have much less stringent listing standards than those imposed by major U.S. stock exchanges (i.e. New York Stock Exchange (NYSE), NASDAQ and AMEX).

In this paper, we examine whether firms in the U.K. strategically consider market valuation when choosing to list via RTO and how effective RTOs are in terms of achieving strategic goals such as business expansion, financing and operation. Different from their U.S. counterparts, U.K. RTO firms have to comply with the same set of listing and disclosure requirements as IPO listing firms do.[3] In the U.K., after an RTO, FCA normally suspends or cancels the public firm's listing. The newly combined firm needs to submit a detailed prospectus and other required materials before obtaining re-admission to exchange listing (See Appendix II of this paper and Chapter 5 of the Financial Conduct Authority (FCA) listing rules for more details). These stringent requirements minimize the benefits of RTO as an expedient and cost-efficient alternative to IPO. Therefore, we conjecture that U.K. private firms are more likely to pursue

[1]UK Financial Conduct Authority (FCA) employs a broad definition of RTO that includes some takeovers between public firms (see Appendix II for more details.). We are interested in RTOs conducted by private firms that seek exchange listing. In the remainder of this paper, to avoid confusing, we use "private firm" to refers to a private firm involved in an RTO, which actually is the surviving firm, and "public firm" to refers to a public firm which is essentially the firm being taken over.

[2]Lee et al. (2014) find that Chinese firms outperform benchmarks after their RTO listings on U.S. market.

[3]In the U.S., before 2011, firms only need to file a Form 8-K to close an RTO transaction. The Security and Exchange Commission toughened listing requirements for RTOs seeking subsequent listing on major exchanges, making it more burdensome to conduct an RTO. However, new rules allow RTO firms to be exempted from standard exchange listing requirements, provided certain conditions are met.

RTOs on strategic grounds rather than simply use them as a convenient substitute for IPO when the later is difficult to achieve.

As is revealed by Figure 1, the ratio of the number of RTOs to the number of IPOs is counter cyclical in that it peaks at the trough of market valuation. Using logistics regressions, we further confirm that private firms prefer RTO to IPO when market valuation is low. This regression result is robust to alternative measures of valuation and to valuation measured at both the market and the firm level. Kim and Weisbach (2008) and Hertzel and Li (2010) posit that equity-issuing firms that take advantage of high market valuation tend to save cash out of their proceeds. We confirm their findings using our sample of U.K. IPOs. However, this cash-saving phenomenon is absent from our RTO sample. When market valuation is high, it is easier for private firms to list through IPO as the public investors are willing to accept pricing that reflects fundamental value. Some firms can even list at inflated prices (i.e., market timing)[4]. On the contrary, when market valuation is low, it is more difficult for an IPO firm to be priced consistently to fundamentals because it is difficult for the listing firm to pass information to a large number of public investors who are pessimistic about the economy's prospects. Our results demonstrate that, when market valuation is low, more private firms strategically resort to RTO and engage in a private takeover negotiation with a public firm. This way, pricing is easier as value-relevant information can be communicated more effectively to the actual or potential shareholders of a public firm than to a broad base of generic public investors. Further and important, low market valuation reduces the cost of taking over a public firm.

To study the effectiveness of RTO compared to IPO, we further examine two important strategic considerations related to listing and highlighted in the previous literature, namely, business expansion and capital raising (Poulsen and Stegemoller 2008). Poulsen and Stegemoller (2008) argue that firms with greater growth opportunities choose to list via IPO. However, we do not find clear evidence that RTO firms invest more conservatively in capital expenditure or acquisitions than IPO firms do in post-listing years. In terms of capital raising, we find that RTO firms issue equity at a similar frequency as IPO firms do. We further find that, when private firms raise more funds from RTO, they subsequently pay less dividend and spend less to retire long-

[4]There is a vast literature on market timing. See Ritter (1984), Ibbotson et al. (1994) among others.

term debt. We do not observe this phenomenon with IPO firms. Previous literature finds that exchange listing enables a firm to access further capital market and certify the firm's quality to capital providers and stakeholders (Röell 1996, Stoughton et al. 2001, Rydqvist and Högholm 1995). Our evidence on capital raising suggests that a successful RTO certifies the quality of a listing firm not only to prospective equity investors but also to existing shareholders and debt holders. Building on successful certification, RTO firms are able to take advantage of the restructuring opportunities and negotiate new terms with existing capital providers. In contrast, IPO firms only target prospective external equity investors and do not have similar opportunity to rearrange payment to existing equity or debt holders. We perform two robustness tests with regard to our dividend payment and debt retiring results. In particular, we use Heckman's (1979) method to control for RTO firm's insider information and other unobservable factors and find our results are robust to this test. However, when we use propensity score matching to control for observable factors that determine RTO vs IPO, these results vanishes. It suggests that when existing capital providers cannot distinguish RTO motives from IPO motives, they refuse to renegotiate the existing financing arrangements with the RTO firms.

Finally, we examine RTO firms' post-listing operating performance relative to IPO firms', following the method of Healy et al. (1992). We find RTO firms exhibit similar performance to IPO firms'.

In summary, we show that private firms strategically time their RTO listing and use RTO to certify firm quality to both existing and prospective capital providers. Combined with our results on RTO firms' operating performance, these results demonstrate that RTOs do not introduce inferior listings, contradicting conclusions drawn from U.S. studies.

Previous literature, mostly conducted in the U.S., gives the mis-impression that RTO is only an expedient and low-cost alternative to IPO, often used by firms that cannot secure listing on main stock exchanges. Gleason et al. (2005) cast doubt on this mis-concept but do not further examine it. Using a sample of U.K. RTOs listed on AIM or the main market, we demonstrate that RTO can be a strategic alternative to IPO for firms seeking exchange listing. We find private firms strategically list shares via RTO under low market valuation when communicating with mass

public investors is difficult. This is consistent with the observation of Gleason et al. (2005) that only a minority of RTOs occur during the hot IPO wave of late 1990s. Semenenko (2011) finds the number of RTOs announced in a quarter is negatively related to aggregate market returns in the previous four quarters. Different from Semenenko (2011), we formally model firm's choice between IPO and RTO, using valuation at the market, the industry and the firm level. Our results also add to those of Derrien and Kecskes (2007) who find U.K. private firms prefer to list via "introduction" in cold market.[5] By examining the effect of valuation on listing firms' choice between IPO and RTO, we also contribute to a literature that study the determinants of RTO (Adjei et al. 2008, Brown et al. 2010). Our results on RTO firms' subsequent expansion, certification to capital providers and operating performance further confirm the strategic motive behind RTOs. We conclude RTO is by no means just an expedient and low-cost alternative to IPOs under U.K.'s institutional setting.

Our results also suggest that the determinants and effectiveness of RTO can be affected by the country-specific institutional environment. Brown et al. (2010) find RTOs take longer to complete than IPOs in Australia and attribute this to the specific Australian institutional environment. Lee et al. (2014) find Chinese firms that list via RTO on the U.S. market out perform their risk-based benchmarks. Our study demonstrate that the U.K. institution contribute to the strategic motives behind private firms listing via RTO. Therefore, further studies of RTO using international data can be fruitful.

The rest of the paper is organized as follows. Section 2 describes the data and sample. Section 3 describes our research design and explains motivation and methodology for each test. Section 4 present our empirical results. Section 5 summaries the conclusion.

[5]The only difference between and introduction and IPO is that issuing firms do not sell shares in an introduction. Existing shareholders trade with one another after introduction.

2 Sample and Data

We obtain our initial RTO sample from the SDC Mergers and Acquisitions Database. SDC has a broad definition of RTO, it includes transactions between two public firms. To focus on RTO as a mechanism of listing, we only include RTOs between a private and a public firm. This yields an initial sample of 292 RTOs during the period from January 1, 1995 to December 31, 2012 [6]. We further drop transactions in which the newly combined firms did not subsequently list on the stock exchange and this guarantees all RTOs we examine are pursued for the purpose of going public rather than purely seeking synergies from business combination. This is done by matching the initial sample to the London Stock Exchange new issue list. Consequently, 195 RTOs remain in the sample. The IPO sample is retrieved from the SDC Global New Issues Database. We obtain 1,472 IPOs in the London Stock Exchange main market and AIM market during our sample period.

We further require data to be available to calculate variables needed for our regression analyses. These data are collected from FAME, Datastream and deal prospectus. This yields a sample of 137 RTOs and 854 IPOs for our analysis of how market valuation impact the choice of RTO versus IPO. In another set of analysis, we examine how capital raised is used in post listing years. This set of study requires three years of data after listing. Sample size reduces further accordingly. Finally, We have 73 RTO firms and 747 IPO firms for these set of analyses.

3 Hypotheses and tests

3.1 Market valuation and the choice of RTO versus IPO

Firms tend to go public through IPO when market condition is favorable so that they can fully exploit market valuation to raise capital. Under favorable market condition, it is easy to convey information about fair firm value to the market and, sometimes, market even over value a listing

[6] We choose 1995 as the beginning year of our sample period, as it is when the Alternative Investment Market (AIM) was established.

firm's equity (Baker and Wurgler 2000, Loughran et al. 1994, Lowry 2003, Pástor and Veronesi 2005, Ritter and Welch 2002). Unlike in an IPO, firms do not solely rely on share issuance to raise funds in an RTO. First, most RTOs involve restructuring. Maksimovic et al. (2011) show that acquiring firms raise funds via vigorously selling target firm's assets during post-merger restructuring. Second, the public firm's cash reserve is another source of funds. Third, RTO represents an efficient way of certifying to potential capital providers, beginning with the shareholder base of the public firm and then expand to a broader shareholder base. Given a listed firm only needs to satisfy minimal requirements to further sell shares, RTO firms could raise funds through follow-on equity issuance when market recovers. These alternative ways of raising funds make market valuation less important for the timing of RTOs. When market valuation is low, it is difficult to validate fundamentals about a listing firm's valuation to a broad base of public investors who are pessimistic and skeptical about the economy's outlook. A firm then can resort to an RTO to list its shares. It is much easier to negotiate with just one public firm and communicate to a much smaller base of shareholders. Adding to the benefit of easy communication is the opportunity of lowering acquisition cost via taking advantage of low market valuation. Specifically, we formulate the following hypothesis,

H1: Listing firms prefer RTO to IPO when market valuation is low.

To test H1, we estimate the following baseline logistic regression:

$$P(\text{RTO}_i = 1|x) = G(\alpha + \beta \text{ Market Valuation}_i + \gamma \text{Controls}_i + \lambda \text{ Industry Dummy}_i + \varepsilon_i), \quad (1)$$

where i indexes sample firms; G(.) is the logistic function; *RTO* is a binary variable equals 1 when a firm chooses RTO and 0 when a firm chooses IPO; *Market Valuation* is a proxy of market conditions which we explain in more details below; *Controls* is a vector of control variables, suggested in the previous literature, that impact a firm's decision to use RTO or IPO. All control variables are defined in Appendix I; *Industry Dummy* is a vector of binary variables indicating industries defined according to the Fama-French 12 industry classification.[7]

[7]Because using the Fama-French 48 industry classification substantially reduces the degree of freedom of our regressions, we use the Fama-French 12 industry classification instead.

We use two sets of proxies for market valuation. The first set is based on market returns. Pástor and Veronesi (2005) develop a model to attribute the fluctuation of IPO volume to the variation in market conditions. They show that IPO volume is positively related to recent aggregate market returns. Baker and Wurgler (2000) find that firms tend to issue equity instead of debt before periods of low market returns. Following these studies, we use three aggregate market return measures covering different time periods to proxy market valuation. In particular, we measure market returns using the FTSE All-Share Index during 3-month (-3 months marek return), 6-month (-6 months market return) and 12-month (-12 months market return) before RTO/IPO. According to H1, RTOs should be preceded by relatively lower market returns than IPOs and therefore β is predicted to be significantly negative.

Our second proxy builds on decomposing the ratio of market to book ratio of equity (P/B).Several previous studies suggest that the predominant reason for firms to go public is to exploit market overvaluation (Lowry 2003, Pagano et al. 1998, Ritter and Welch 2002). The P/B ratio contains information on both growth opportunity and misvaluation.[8] Following Lee, et al. (1999), we decompose the P/B ratio into two parts: one is the price-to-value ratio (hereafter P/V), which measures misvaluation and the other is value-to-book-value ratio (hereafter V/B), which reflects the potential growth opportunities. According to H1, we expect that the higher the P/V ratio is the lower the probability a firm will choose RTO.

The value (V) is estimated using a residual income model over a three-period forecast horizon:

$$V_t = B_t + \frac{(FROE_{t+1} - r_e)}{(1+r_e)} B_t + \frac{(FROE_{t+2} - r_e)}{(1+r_e)^2} B_{t+1} + \frac{(FROE_{t+3} - r_e)}{(1+r_e)^2 r_e} B_{t+2}, \qquad (2)$$

where B_{t+i} is the book value of equity for period $t+i$; r_e is the annualized cost of equity;[9]

[8]Market price is a forward-looking measure and high market value indicates that a firm is running well and has good future perspective. Book value reflects historical costs. Therefore, P/B ratio captures growth opportunity. At the same time, to the extent that market value may deviate from the true fundamental value for a firm, P/B ratio can capture misvaluation.

[9]In this study, we use two methods to compute the annualized cost of equity (r_e). One is a constant rate of 12.5%, following D'mello and Shroff (2000), the other is a firm-specific cost of equity determined by the Capital Asset Pricing Model (CAPM), following Dong et al. (2006). The results are insensitive to alternative measures, similar to what D'mello and Shroff (2000) and Lee, et al. (1999) observe. For brevity, we only report the results using the constant cost of equity.

$FROE_{t+i}$ is the forecasted ROE for period $t+i$.

$$B_{t+i} = B_{t+i-1} + (1-k)\,FEPS_{t+i}, \tag{3}$$

where $FEPS_{t+i}$ is the forecasted EPS for period $t+i$ from I/B/E/S. k is the dividend payout ratio computes as D_t divided by EPS_t.

$$FROE_{t+i} = \frac{FEPS_{t+i}}{\bar{B}_{t+i-1}}, \tag{4}$$

where

$$\bar{B}_{t+i-1} = \frac{B_{t+i-1} + B_{t+i-2}}{2}, \tag{5}$$

Since the residual income value (V) is estimated by using analysts' forecasts of future earnings, P/V ratio excludes information about growth and managerial agency problems contained in P/B ratio and is a better measure of misvaluation than P/B. Compared to using market return as the proxy for market conditions, using these ratios enables us to explicitly distinguish between the overvaluation effect (measured by P/V) and the growth effect (measured by V/B) on a firm's choice between RTO and IPO.

Since the market value and the analyst forecasts data are not available for private firms, we cannot directly calculate the firm-level P/V and V/B ratio. We therefore begin with using the market-wide P/V and V/B measured as the median ratio of all U.K. listed firms in the month prior to listing. To allow the firm-level analysis, we use the implied value of P/V and V/B. Specifically, for each sample firm, we match it with a recently listed firm that is from the same industry and is closest in size and then we use the P/V and V/B ratio of this matched public firm as the implied P/V and V/B ratio of the sample firm. This leads to further sample attrition as we cannot find a matching recently listed firm for every sample firm.

3.1.1 Post-listing cash savings

A listing firm's post-listing pattern of cash saving represents a further opportunity to analyze the extent to which market valuation relates to RTO and IPO. We cannot directly observe a listing firm's motive of exploiting favorable market valuation. However, several studies suggest that this motive relates to a listing company's behavior of cash savings out of the capital raised. McLean (2011) reports that, during the latest decade, US firms save $0.60 cash out of $1.00 of share issuance proceed, suggesting cash savings constitutes a primary motive of the listing. Hertzel and Li (2010) and Kim and Weisbach (2008) point out that IPO firms with higher overvaluation save more cash out of proceeds in years following share issuance whereas firms with greater growth opportunities tend to spend more on real assets. Motivated by these studies and given our conjecture that listing via RTO is less dependent on high market valuation, , we formulate our second hypothesis,

H2: Compared to IPO firms, RTO firms are less likely to save cash out of capital raised.

We test H2 by estimating a regression equation in the spirit of Kim and Weisbach (2008), for IPO and RTO firms respectively. Specifically,

$$\begin{aligned}\Delta\text{Cash}_t = \alpha &+ \beta_1 \ln\left[1+\frac{\text{Capital Raised}}{\text{Total Assets}_0}\right] + \beta_2 \ln\left[1+\sum_{\tau=1}^{t}\frac{\text{Total Funds}_\tau}{\text{Total Assets}_0}\right] + \beta_3 \ln(\text{Total Assets}_0) \\ &+ \theta_i \sum_{i=1995}^{2012} \text{Year Dummy}_i + \gamma_j \sum_{j=1}^{11} \text{Industry Dummy}_j + \varepsilon_t,\end{aligned} \tag{6}$$

where

$\Delta\text{Cash}_t = \ln[1 + (\text{Cash}_t - \text{Cash}_0)/\text{Total Assets}_0]$

Year t = 0 is the year prior to listing, and t = 1, 2, 3 year after listing. *Total Funds* is the sum of funds from operations, sale of property, plant, and equipment, long-term debt issuances, and sale of common and preferred stock. *Industry dummy* is created according to the Fama-French 12 industries classification. For IPOs, *Capital Raised* is the product of the number of primary shares issued and the offer price. For RTOs, *Capital Raised* is the sum of the cash reserves of the public firm before the RTO and the proceeds from equity issuance (if any) at the RTO.

Total Assets$_0$ of RTO firms are combined assets of the public firm's total assets excluding cash and the private firm's total assets at the end of the year prior to the RTO.

3.2 The effectiveness of RTO

In this section, we examine how effective RTOs are, compared to IPOs, in allowing listing firms to achieve their strategic goals, namely business expansion and certification to internal and external capital providers (Paulsen and Stegemoller (20008)).

3.2.1 Post-listing business expansion

Prior literature suggests that facilitating future business expansion is a significant motive of going public. Poulsen and Stegemoller (2008) argue that firms with greater growth opportunities choose to list via IPO. Consistent with this view, Kim and Weisbach (2008) find that the capital raised in an IPO are more likely to be spent on both capital expenditures and R&D, which leads to growth in total assets in the post-listing years. To test how to achieve the strategic goal of business expansion, we follow the specification in Kim and Weisbach (2008) to investigate how listing firms use funds on total asset, capital expenditure, and acquisitions in the post-listing years. Specifically,

$$\begin{aligned} Y_t = \alpha + \beta_1 \ln\left[1+\frac{\text{Capital Raised}}{\text{Total Assets}_0}\right] + \beta_2 \ln\left[1+\sum_{\tau=1}^{t}\frac{\text{Total Funds}_\tau}{\text{Total Assets}_0}\right] + \beta_3 \ln(\text{Total Assets}_0) \\ + \theta_i \sum_{i=1995}^{2012} \text{Year Dummy}_i + \gamma_j \sum_{j=1}^{11} \text{Industry Dummy}_j + \varepsilon_t, \end{aligned} \tag{7}$$

where

$Y_t = \ln[1 + (\sum_{\tau=1}^{t} V_\tau / \text{Total Assets}_0)]$ for V = capital expenditure (CAPEX) and acquisitions.

$Y_t = \ln[1 + (V_t - V_0) / \text{Total Assets}_0]$ for V = total assets.

Year t = 0 is the year prior to listing, and t = 1, 2, 3 year after listing. Independent variables are

the same as those defined under equation (6).

3.2.2 Certification effect to internal capital providers

In the process of business combination, firms going public via RTO are able to take advantage of the restructuring opportunities and negotiate new terms with existing capital providers (internal capital provider), while IPO firms are not able to do so. In this subsection, we investigate the potential certification effect to internal capital providers by examining how listing firms use raised capital for dividend payment and long-term debt reduction. If a RTO certifies firm quality to internal capital providers, we expect to observe that RTO firms spend less proportion of capital raised on paying dividends or retiring long-term debt. We use the specification similar to Equation (7) to test this hypothesis:

$$Y_t = \alpha + \beta_1 \ln\left[1 + \frac{\text{Capital Raised}}{\text{Total Assets}_0}\right] + \beta_2 \ln\left[1 + \sum_{\tau=1}^{t} \frac{\text{Total Funds}_\tau}{\text{Total Assets}_0}\right] + \beta_3 \ln(\text{Total Assets}_0) + \theta_i \sum_{i=1995}^{2012} \text{Year Dummy}_i + \gamma_j \sum_{j=1}^{11} \text{Industry Dummy}_j + \varepsilon_t, \tag{8}$$

where

$Y_t = \ln[1 + (\sum_{\tau=1}^{t} V_\tau / \text{Total Assets}_0)]$ for V = dividend payment, and reduction in long-term debt.

Year t = 0 is the year prior to listing, and t = 1, 2, 3 year after listing. Independent variables are the same as those defined under equation (6).

3.2.3 Certification effect to external equity investors

According to previous studies conducted for U.S. firms, the RTO process is relatively fast and cost efficient compared to the IPO process. It is not necessary to hire investment banks as underwriters or conduct a roadshow. Due to this simplified process, an RTO firm may not receive similar attention from prospective equity investors, which in turn could reduce the external certification benefit of going public. Certification to external equity investors is important because

firms may use going public to signal their quality (Bustamante 2011, Stoughton et al. 2001, Rydqvist and Högholm 1995). Weak certification could result in difficulty of raising funds through follow-on equity issuance. To examine how effective RTOs are in terms of certification to external equity investors, we further investigate whether RTO firms differ from IPO firms in terms of the I/B/E/S analyst coverage and follow-on equity issuance activities in the post-listing years. Specifically, we estimate the regression equations as follows. If firms going public by RTO can receive similar level of external certification effect, we should observe non-negative coefficients associated with the RTO dummy variable.

$$\begin{aligned} P(\text{Follow-on issuance}_i = 1|x) =& G(\alpha + \beta \text{ RTO dummy}_i + \gamma \text{Controls}_i \\ &+ \lambda \text{ Industry Dummy}_i + \sigma \text{ Year Dummy}_i + \varepsilon_i), \end{aligned} \tag{9}$$

$$\begin{aligned} P(\text{Analyst Coverage}_i = 1|x) =& G(\alpha + \beta \text{ RTO dummy}_i + \gamma \text{Controls}_i \\ &+ \lambda \text{ Industry Dummy}_i + \sigma \text{ Year Dummy}_i + \varepsilon_i), \end{aligned} \tag{10}$$

where i indexes sample firms; G(.) is the logistic function; *Follow-on issuance* is a binary variable equals 1 if the firm raises additional capital through follow-on equity issuance during the 3-year period following listing, and 0 otherwise; *Analyst Coverage* is a binary variable equals 1 if the firm is covered by the I/B/E/S database during the 3-year period following listing, and 0 otherwise; *RTO dummy* equals 1 if the firm going public by RTO and 0 if the firm going public by IPO; *Controls* is a vector of control variables, including log(Total Asset), Return on assets, Capital intensity and Leverage; *Industry Dummy* is a vector of binary variables indicating industries defined according to the Fama-French 12 industry classification. *Year Dummy* is a vector of binary variables with each element representing a year during the sample period.

3.2.4 Post-listing operating performance

Previous studies on U.S. RTOs suggest RTO introduces inferior listings compared to IPO (Gleason et al. 2005, Adjei et al. 2008, Arellano-Ostoa and Sandro, 2002). In this subsection, we

compare the post-listing operating performance between the RTO and the IPO firms to see whether U.K. RTO firms deliver inferior operating performance. Following Barber and Lyon (1996) and Healy et al. (1992), we measure a firm's actural operating performance by its operating cash flow deflated by total assets.[10] In each year, we adjust the actual operating performance by the median value of those firms in the same Fama-French 12 industry. The adjusted yearly operating performances are then averaged over 3 years both before and after listing. We examine the post-listing operating performance using the following equation:

$$\begin{aligned}\text{Post-listing Adj.}\,OPCF/TA_i = &\alpha + \beta_1 \text{ Pre-listing Adj.}\,OPCF/TA_i + \beta_2 \text{ RTO Dummy}_i \\ &+ \theta_t \sum_{t=1995}^{2011} \text{Year Dummy}_t + \varepsilon_i,\end{aligned} \tag{11}$$

where i indexes the listing firms. β_1 captures the continued operating performance in post-listing years. α and β_2 capture the incremental operating performance as a consequence of the listing. In addition, β_2 captures the difference in the incremental operating performance between IPO firms and RTO firms in post-listing years.

3.2.5 Addressing selection bias

The choice between RTO and IPO is endogenous. To address this self-selection bias, we employ two methods. One is the propensity score matching approach (Rosenbaum and Rubin 1983), and the other is the Heckmen two-step approach (Heckman 1979).

The propensity score matching approach allows us to identify a control sample of IPO firms have similar propensity to list via RTO. By comparing the RTO sample with the matching IPO sample, we can rule out the possibility that our results are driven by other observable characteristics of listing firms rather than RTO itself. To estimate the propensity score, we use Model (5) in Table 3. To ensure the matching IPO sample is sufficiently similar to our RTO sample, we apply the closest matching method and require that the maximum difference between the score of each RTO sample firm and its matching IPO firm does not exceed 0.1% in

[10]For RTO firms, the pre-listing actual operating performance is the average value of the target firm's and the acquiring firm's operating cash flow deflated by total assets.

absolute value. We are able to find a matching IPO for 68 RTOs in our sample.

To control for the selection bias due to unobservables, we use the Heckmen two-step approach. In the first step, we estimate the choice between IPO and RTO by Model (5) in Table 3 and calculate the Inverse Mills Ratio (IMR). In the second step, we include the IMR. A significant coefficient IMR indicate the selection bias is significant and, in this case, we rely on the self-selection-adjusted two-step regression for our statistical inference. Otherwise, we rely on the OLS regression estimates for inference.

4 Empirical results

4.1 Market valuation and the choice of RTO versus IPO

4.1.1 Univariate analysis

Figure 1 and Panel A of Table 1 show the time distribution of IPOs and RTOs in our sample.[11] Consistent with previous literature (Baker and Wurgler 2000, Lowry 2003, Loughran et al. 1994, Pástor and Veronesi 2005, Ritter and Welch 2002), IPO volume is higher when market valuation is higher. Meanwhile, the ratio of the number of RTO to the number of IPO follows a counter cyclical relation where RTO volume peaks at the through of IPO waves. This observed pattern is consistent with our H1.

Panel A of Table 2 presents descriptive statistics for the variables used in our baseline regressions. The results show that RTO firms are smaller (by total assets) and less profitable (by return on assets) than IPO firms, which is consistent with the observation of Floros and Sapp (2011) and Gleason et al. (2005). However, RTO firms are not significantly different from IPO firms in cash holdings and leverage ratio to IPO firms. This suggests that RTO firms are not financially constrained, which is contrary to the findings in previous studies (e.g., Adjei et al. (2008), Arellano Ostoa and Brusco (2002), Bayar and Chemmanur (2006), Gleason et al. (2005)). In terms

[11] To better compare the time distribution of IPOs and RTOs, we normalize the scales in Figure 1.

of the variables measuring market valuation, we observe that both the market returns and the P/V ratio are lower for RTO firms, which is consistent with our H1.

Panel B of Table 2 compares the characteristics of the private firms and the public firms involved in the RTO. The private firms exhibit significantly higher operating performance (measured by return on assets) and asset turnover than acquiring firms. Meanwhile, the private and public firms are similar in size but the public firms hold more cash. This indicates that the public firms' cash reserve is an important source of funds for the private firms listing via RTO.

4.1.2 Baseline results

We present the results of the baseline logistic regressions in Table 3. First, we provide evidence to show how pre-listing market returns affect the choice of RTO and IPO. In Model 1, 2 and 3, we estimate equation (1) using market returns measured over three different time periods (3 months, 6 months and 12 months prior to the IPO/RTO). Consistent with H1, all three market return measures have significantly negative coefficients (see Model 1, 2 and 3). The marginal effects indicate that a 10% increase in the -3 months/-6 months/-12 months market return results in a 6.41%/5.31%/3.09% decrease in the probability of listing through RTO. To put this results into context, the unconditional probability of choosing RTO in the sample is 13.82%. This suggests that the pre-listing market return, to a considerable extent, explains the choice of listing through an RTO.

In Model 4, we decompose the 12 month market returns prior to listing into returns of three sub-periods:1 to 3 month (-3 months), 4 to 6 months (-6 to -4 months), and 7 to 12 months (-12 to -7 months) prior to listing. This decomposition enables us to further understand a firm's decision horizon for the choice of RTO versus IPO. We observe that the coefficients associated on -3 months market return and the -6 to -4 months market return are both significant (at the 5% and 1% level respectively) and negative, whereas the coefficient of the -12 to -7 months market return is insignificant, indicating that the choice between RTO and IPO is sensitive to the market conditions in the most recent 6 months prior to listing.

In Model 5, 6 and 7, we use the market-level P/V and V/B ratio to measure market valuation, which allows us to distinguish between fair valuation and overvaluation. The significantly negative coefficient associated on the market-level P/V ratio in Model 5 confirms our H1 that, private firms are more likely to choose an RTO when market valuation is lower. The marginal effect we estimate in Model 5 indicates that a 10% increase in the market-level P/V ratio leads to 11.8% decrease in this probability of choosing an RTO. We estimate Model 7, further controling for the effect of growth opportunities by including V/B in the regression. We observe a significantly negative coefficient on the market-level P/V ratio but an insignificant coefficient on the market-level V/B ratio. In Model 6, where we have V/B and drop P/V, we find V/B has a negative coefficient (-1.796) which is only marginally significant at the 10% level. Together, these results indicate that it is market overvaluation rather than growth opportunities that drive a firm's choice of the RTO versus IPO.

In Model 8, 9 and 10 of Table 3, we use the implied firm-level P/V and V/B ratio to check how robust the results above are to variation in firm-level valuation. Because we are not able to find a recently listed firm for every private firm in our sample, the sample size reduces to 668. Overall, we find results that are qualitatively the same to what we find with market level ratios. In model 8, the coefficient on firm-level P/V ratio is -0.032 and significant at the 1% level. The marginal effect is much lower compared to the effect of market level P/V. A 10% increase in P/V at firm level reduces the probability of RTO by 0.3%. This suggests that the overall market condition is more important for a listing firm to choose between RTO and IPO. In model 10, in include both P/V and V/B in the regression. We note that the significantly negative coefficient on firm-level P/V ratio persists and the V/B ratio is significantly (at the 1%) positive. This indicates that listing firms with more growth opportunities are more likely to choose RTO. In model 9, we only include V/B ratio and drop P/V ratio and the significantly positive coefficient on V/B persists. Overall, results in table 3 are consistent with our H1 that, when market valuation is low, private firms strategically resort to RTO for listing.

4.1.3 Post-listing cash savings

In Table 4, we report the regression estimates of Equation (6) using OLS, the Heckman two-step approach and the propensity score matching approach. The results here shed further light on understanding the extent to which the motive of exploiting market valuation relates to RTO and IPO. In line with Kim and Weisbach (2008), in Panel A, we observe that the coefficients on *Capital Raised* of IPO firms are significantly positive in all the post-listing years. For example, the coefficient is 0.434 in year 3 and statistically significant at the 1% level, which suggests that a one-dollar increase in the capital raises lead to a 43-pence increase in cash savings in year 3 post-listing. This positive coefficient on capital raised remains qualitatively unchanged in panel B and C where we use the propensity-score matching and the Heckman two-step method respectively. In panel D, we use the Heckman two-step method and introduce the interaction terms between Capital Raised and the high P/V dummy and the high V/B dummy. We find the coefficient on the interaction term between high P/V dummy and capital raised is significantly (at the 1% level) positive for all the post-listing years. At the same time, the coefficient on Capital Raised remains significantly positive. This is consistent with the view that more overvalued IPO firms are more likely to save cash from capital raised, consistent with Kim and Weisbach (2008) and Hertzel and Li (2010).

In contrast, for the RTO sample in panel A, the coefficient on Capital Raised is only significantly (at the 5% level) positive in year one and the magnitude is much lower (0.456) compared to the corresponding coefficient for IPO (0.832). This positive coefficient is not robust to the variation based on propensity score matching. For year 2 and 3, the coefficient on Capital Raised are statistically insignificant in under all specifications in panel A to D. In panel D, we fails to find a coefficient on the interaction term between Capital Raised and the high P/V ratio dummy, which demonstrates that even for RTO firms more likely to be overvalued, the motivation to time market valuation is weak.

4.2 The effectiveness of RTO

4.2.1 Post-listing business expansion

To analyze RTO firms strategy of seeking expansion and growth via listing, we investigate how *Capital Raised* relates to their changes in total assets, accumulated cash spending on capital expenditure and accumulated cash spending on acquisitions. Accumulated spending on capital expenditure reflect the use of funds on internal growth and accumulated spending on acquisitions demonstrates the use of funds on external growth.

Overall, the results are mixed. There is no clear evidence that RTO firms are more or less aggressive than IPO firms in expanding their business in post-listing years. In panel A, where we use OLS regressions, the coefficient on Capital Raised for the IPO sample is significantly positive in all years for both the change in total assets regression and the capital expenditure regression. For the RTO sample, this coefficient is only significant in the first year of the change-n-total-assets regression. But when we test the equality in coefficients between RTO and IPO firms, we fail to reject the null that there is no significant difference between RTO firms and IPO firm, with one exception which is the change-in-total-assets regression in years 2. Turning to the the regression of spending on acquisitions, only in year 1 that IPO firms exhibit a significant higher coefficient on Capital Raised (0.213) than the RTO firms. When we use the Heckman two-step method and the propensity score matching, our previous observation persist. Overall, there is no clear evidence that RTO firms are more or less aggressive than IPO firms expanding their business in post-listing years.

4.2.2 Certification effect to internal capital providers

Another strategic role of listing is to certify the quality of the listing firm to internal and external capital providers (Roell (1996); Stoughton, Wong and Zechner (2001); Ferrari (1992); Rydqvist and Hogholm (1995)). By internal, we refer to capital providers who are existing shareholders or creditors of the listing firm; by external, we refer to potential equity investors in the post-

listing years. Table 6 reports the regression estimates of Equation (8), examining how capital raised relates to dividend payment and spending on long-term debt reduction. In Panel A (OLS regressions), we observe that the coefficients on *Capital Raised* is significantly positive in every year for both the spending-on-dividend and the spending-on-debt-reduction regression. For example, in the first year, the coefficient on Capital Raised in the spending-on-dividend regression is -0.085 (significant at the 5%), which indicate that when the *Capital Raised* increases by one dollar, the spending on dividends reduces by 8.5 pence. This finding suggests that the higher *Capital Raised* plays a stronger effect in certifying the quality of the listing firm and , when internal capital providers observe this, they are willing to keep more of their investments within the listing firm. Therefore, RTO also provides a good opportunity for the listing firm to re-structure the agreements with existing capital providers. Moving on to the IPO firms, we do not find a significantly negative coefficient on *Capital Raised* in any of the regressions, contrary what we find with RTO firms. Wald tests of equality of coefficient cross regressions suggests that the coefficient on *Capital Raised* changes significant between RTO and IPO in all years. In panel B, we repeat our analysis in panel A using the Heckman two-step method and the results are largely consistent. In panel C, we repeat the analysis using propensity-score matching and find the negative coefficient on *Capital Raised* vanishes. Since the propensity-score matching approach controls for the observable factors that determines the choice of RTO and IPO, this result suggests that, when internal investors cannot distinguish the motive of RTO from that of IPO, they are not prepared to keep more of their investment in the RTO firm via restructuring their financing agreements with the RTO firm.

4.2.3 Certification effect to external equity providers

Table 7 reports our findings on the certification effect to internal capital providers, which is another important dimension of the strategic roles of listing. Specifically, we investigate the I/B/E/S analysts coverage and follow-on equity issuance activities in the post-listing years. Previous studies on listing firms argue that analysts coverage adds value to listing firms through two mechanisms. One is non-financial aspect. Better analysts coverage following listing can

increase a firm's publicity and attract new consumers (Cliff and Denis 2004). The other is financial aspect, better analyst coverage following listing can boost the share price (Aggarwal et al. 2002, James and Karceski 2006) and facilitate future financing (Chang et al. 2006). In Panel A of Table 7, we investigate the number of firms received analysts coverage in the post-listing years, we do not observe significant difference between RTO firms and IPO firms. 63.01% of RTO firms receive coverage of the I/B/E/S database within the three years after going public while 66.27% of IPO firms do. However, the average number of analysts for IPO firms is significantly larger than that for RTO firms. In terms of the follow-on equity issuance, we show that higher proportion of RTO firms (63.01%) raised additional capital through follow-on equity issuance than IPO firms (52.21%) during the 3-year period after listing, but the difference is marginally significant at 10% level. This difference is mainly driven by a significant number of follow-on equity issuance made by RTO firms in the first year following listing.

In Panel B of Table 7, we report the regression estimates of Equation (9) and (10). The insignificant coefficients on *RTO dummy* indicates that there is no significant difference between RTO firms and IPO firms in terms of the follow-on equity issuance activities and analyst coverage in post-listing years. This finding is also robust after using the Heckman two-step method and the propensity score matching method to control for selection bias.

In short, our results suggest that, unlike U.S. RTO firms, U.K. RTO firms receive similar certification effect to external equity providers through listing comparing with their IPO counterparts.

4.2.4 Post-listing operating performance

In this section, we analyze whether RTO firms differ from IPO firms on post-listing operating performance. We report the regression estimates of Equation (11) in Table 8. In Model 1, we do not include *RTO dummy*. The significantly positive constant term suggests that, on average, operating performances improves after listing. In Model 2, we add the *RTO dummy*. The coefficient on *RTO dummy* is positive but insignificant, which indicates that, on average, RTO firms yield an operating performance similar to that of IPO firms'. This finding is in line with our

conjecture that RTO does not introduce inferior listings under the U.K. regulatory framework, contrary to what is suggested by studies on U.S. RTOs.

5 Conclusion

Using a sample from the U.K., we examine the determinants and effectiveness of RTOs. The stringent requirements imposed on RTO listing reduce the benefits of RTO as a fast and cost-efficient alternative to IPO. Rather, our results demonstrate that when market valuation is low, private firms are more likely to strategically resort to RTO for listing. By choosing RTO, a listing firm only needs to communicate with the shareholders of a public firm rather than with a large number of public equity investors; further, RTO firms can take advantage of low market valuation to acquire a public firm.

Post listing, we find no clear evidence showing that RTP firms are different from IPO firms in operating performance, business expansion or certification to prospective equity investors in post-listing years. Different from IPO firms, RTO firms spend less funds on dividends and reducing long-term debt, consistent with the interpretation that RTO certifies a listing firm's quality to internal capital providers and these capital providers agree to keep more of their investments within the RTO firms. Overall, we demonstrate that RTOs do not introduce inferior listings in the U.K.

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Table 1: Distribution of listing firms by industry and year

Panel A: Distribution by year

	RTO		IPO		
Year	Number	Percent	Number	Percent	No. of RTO/No. of IPO
1995	0	0.00	2	0.23	0.00
1996	2	1.46	9	1.05	0.22
1997	5	3.65	44	5.15	0.11
1998	7	5.11	31	3.63	0.23
1999	8	5.84	12	1.41	0.67
2000	15	10.95	55	6.44	0.27
2001	10	7.30	41	4.80	0.24
2002	8	5.84	31	3.63	0.26
2003	8	5.84	19	2.22	0.42
2004	4	2.92	130	15.22	0.03
2005	21	15.33	118	13.82	0.18
2006	20	14.60	136	15.93	0.15
2007	7	5.11	118	13.82	0.06
2008	9	6.57	20	2.34	0.45
2009	5	3.65	2	0.23	2.50
2010	4	2.92	30	3.51	0.13
2011	1	0.73	25	2.93	0.04
2012	3	2.19	31	3.63	0.10
Total	137		854		

Panel B: Distribution by the private firms' industry (Fama-French 12 industries classification)

		IPO		RTO	
Industry code	Classification	Number	Percent	Number	Percent
1	Consumer NonDurables: Food, Tobacco, Textiles, Apparel, Leather, Toys	6	4.38	37	4.33
2	Consumer Durables: Cars, TVs, Furniture, Household Appliances	1	0.73	11	1.29
3	Manufacturing	0	0.00	40	4.68
4	Oil, Gas, and Coal Extraction and Products	4	2.92	55	6.44
5	Chemicals and Allied Products	3	2.19	16	1.87
6	Business Equipment: Computers, Software, and Electronic Equipment	31	22.63	142	16.63
7	Telephone and Television Transmission	12	8.76	38	4.45
8	Utilities	1	0.73	8	0.94
9	Wholesale, Retail, and Some Services (Laundries, Repair Shops)	9	6.57	54	6.32
10	Healthcare, Medical Equipment, and Drugs	12	8.76	69	8.08
11	Finance	21	15.33	135	15.81
12	Other	37	27.01	249	29.16
Total		137		854	

Table 2: Summary statistics

Panel A reports the summary statistics of the sample used to estimate the effect of market valuation on the choice of RTO versus IPO. Panel B reports the summary statistics of private and public firms involved in RTOs. Panle C reports the summary statistics of the data used to examine the effectiveness of RTO. Control variables included in the regressions but unreported for brevity are log(Total Assets), Return on assets, Capital intensity, and Leverage. All variables are defined in Appendix I. Two-sample t-tests are conducted to test the significance of the differences in means. Z-statistics for the statistical significance of the differences in medians are based on the Wilcoxon rank sum test. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

	Panel A: Market value and the choice of RTO versus IPO						Panel B: Private versus public firms					
	Mean			Median			Mean			Median		
	IPO	RTO	t-stat	IPO	RTO	Z-stat	Private	Public	t-stat	Private	Public	Z-stat
log(Total Assets)	9.807	8.403	5.059***	9.314	8.343	4.838***	8.403	7.954	1.086	8.343	7.979	0.920
Asset turnover	1.188	1.784	−2.623***	0.769	1.205	−3.709***	1.784	0.670	3.175***	1.205	0.201	6.168***
Cash / Total Assets	0.162	0.179	−0.840	0.064	0.076	−1.914*	0.179	0.471	−6.699***	0.076	0.323	−5.245***
Leverage	0.238	0.166	0.904	0.033	0.011	1.526	0.166	0.033	2.995**	0.011	0.000	3.139***
Return on assets	−0.018	−0.075	1.476	0.085	−0.005	4.570***	−0.075	−0.395	3.341***	−0.005	−0.110	4.157***
−3 months market return	0.030	0.008	4.559***	0.036	0.024	3.165***						
−6 months market return	0.064	0.025	5.426***	0.078	0.042	3.484***						
−12 months market return	0.138	0.076	5.263***	0.159	0.127	3.736***						
−6 to −4 months market return	0.033	0.016	3.284***	0.036	0.027	2.151**						
−12 to −7 months market return	0.069	0.047	2.845***	0.081	0.073	2.385**						
Market-level P/V ratio	1.646	1.581	3.109***	1.632	1.621	2.275**						
Market-level V/B ratio	1.338	1.331	0.777	1.370	1.354	0.427						
RTOs with equity issuance (%)		38.89										
No. of obs	854	137		854	137		137			137		
Firm-level P/V ratio	7.584	3.369	2.725***	1.681	1.594	2.143**						
Firm-level V/B ratio	2.249	3.141	−3.485	1.614	2.074	−2.575***						
No. of obs	587	81		587	81							

Table 2 (Continued)

Panel C: Variables used to examine the effectiveness of RTO							
		Mean			Median		
Variable	t	IPO	RTO	t-stat	IPO	RTO	Z-stat
Sources of funds							
Capital Raised/Total Assets$_0$	1	2.033	1.993	0.106	0.769	0.778	0.289
ΣTotal Funds	1	0.758	0.792	−0.293	0.420	0.402	0.559
	2	1.705	1.878	−0.635	0.880	0.894	−0.147
	3	2.993	3.042	−0.090	1.326	1.517	−0.556
Post-listing cash savings							
ΔCash	1	1.062	0.728	1.308	0.205	0.035	4.005***
	2	−0.201	−0.184	−0.122	−0.016	−0.024	−0.364
	3	−0.084	0.108	−1.894*	−0.001	−0.015	0.092
Variables related to business expansion							
ΔTotal Assets	1	2.363	3.681	−2.635***	0.770	1.590	−2.258**
	2	0.871	−0.633	3.900	0.239***	0.102	1.093
	3	0.733	0.569	0.557	0.178	−0.043	1.89*
ΣCAPEX	1	0.168	0.171	−0.083	0.061	0.025	3.389***
	2	0.430	0.472	−0.502	0.155	0.107	1.92**
	3	0.705	0.665	0.315	0.256	0.135	1.294
ΣAcquisitions	1	0.136	0.349	−3.625***	0.000	0.000	−0.505
	2	0.068	0.270	−4.692***	0.000	0.000	−0.996
	3	0.000	0.008	−6.573***	0.000	0.000	−6.41***
Variables related to certification to internal capital providers							
ΣDividend	1	0.009	0.015	−1.873*	0.000	0.000	1.026
	2	0.029	0.018	1.553	0.000	0.000	2.483**
	3	0.054	0.024	2.444**	0.000	0.000	2.626***
ΣLong-term Debt Reduction	1	0.122	0.054	2.638***	0.006	0.002	1.751*
	2	0.194	0.136	1.542	0.026	0.044	−0.506
	3	0.307	0.271	0.636	0.073	0.101	−1.066
No. of obs (for t=1, 2 and 3)		747	73		747	73	
Post-listing operating performance							
Post-listing Adj. OPCF/TA	1-3	−0.049	−0.014	−1.472	0.056	0.055	0.356
Pre-listing Adj. OPCF/TA	1-3	−0.186	−0.375	1.120	0.048	−0.060	2.419**
No. of obs		247	25		247	25	

Table 3: Market valuation and the choice of RTO versus IPO

This table shows the results of the logistic regressions estimating the effect of market valuation on a firm's choice between RTO and IPO. The dependent variable is a binary variable equals 1 if a firm chooses RTO, and 0 if a firm chooses IPO. All variables are defined in Appendix I. Control variables are measured at the end of the fiscal year prior to listing. Industry dummies are defined according to the Fama-French 12 industries classification. Standard errors are robust to heteroskedasticity and *p*-values are reported in parentheses. The marginal effect of each regressor is measured at sample mean and reported in square brackets. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
−3 months market return	−6.348***			−5.372***			
	(0.001)			(0.007)			
	[−0.660]			[−0.551]			
−6 months market return		−5.298***					
		(0.000)					
		[−0.543]					
−12 months market return			−3.094***				
			(0.000)				
			[−0.318]				
−6 to −4 months market return				−4.623**			
				(0.016)			
				[−0.474]			
−12 to −7 months market return				−1.089			
				(0.413)			
				[−0.112]			
Market-level P/V ratio					−1.121**		−0.977**
					(0.015)		(0.028)
					[−0.118]		[−0.103]
Market-level V/B ratio						−1.796*	−1.267
						(0.098)	(0.247)
						[−0.191]	[−0.133]
log(Total Assets)	−0.154***	−0.158***	−0.152***	−0.152***	−0.162***	−0.180***	−0.168***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[−0.016]	[−0.016]	[−0.016]	[−0.016]	[−0.017]	[−0.019]	[−0.018]
Asset turnover	0.052	0.053	0.058	0.055	0.048	0.052	0.050
	(0.165)	(0.154)	(0.117)	(0.135)	(0.254)	(0.210)	(0.238)
	[0.005]	[0.005]	[0.006]	[0.006]	[0.005]	[0.006]	[0.005]
Cash	−0.274	−0.329	−0.254	−0.320	−0.207	−0.269	−0.252
	(0.492)	(0.419)	(0.528)	(0.433)	(0.611)	(0.514)	(0.541)
	[−0.029]	[−0.034]	[−0.026]	[−0.033]	[−0.022]	[−0.029]	[−0.026]
Leverage	−0.248	−0.287*	−0.265	−0.277*	−0.259*	−0.254*	−0.261*
	(0.128)	(0.079)	(0.110)	(0.091)	(0.098)	(0.098)	(0.092)
	[−0.026]	[−0.029]	[−0.027]	[−0.028]	[−0.027]	[−0.027]	[−0.027]
Return on assets	−0.200	−0.156	−0.141	−0.151	−0.198	−0.194	−0.194
	(0.407)	(0.497)	(0.535)	(0.517)	(0.394)	(0.407)	(0.407)
	[−0.021]	[−0.016]	[−0.015]	[−0.015]	[−0.021]	[−0.021]	[−0.020]
Constant	−0.580	−0.397	−0.411	−0.421	1.168	1.923	2.688*
	(0.131)	(0.294)	(0.276)	(0.276)	(0.148)	(0.220)	(0.092)
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs	991	991	991	991	991	991	991
Pseudo R-square	0.073	0.085	0.081	0.086	0.064	0.060	0.066

Table 3 (Continued)

Variable	Model 8	Model 9	Model 10
Firm-level P/V ratio	-0.032^{***}		-0.026^{***}
	(0.000)		(0.000)
	[−0.003]		[−0.002]
Firm-level V/B ratio		0.140^{***}	0.115^{***}
		(0.001)	(0.008)
		[0.013]	[0.01]
log(Total Assets)	-0.179^{**}	-0.190^{**}	-0.168^{*}
	(0.025)	(0.032)	(0.050)
	[−0.016]	[−0.018]	[−0.015]
Asset turnover	0.015	0.021	0.019
	(0.513)	(0.387)	(0.431)
	[0.001]	[0.002]	[0.002]
Cash	0.168	0.240	0.205
	(0.686)	(0.530)	(0.593)
	[0.015]	[0.022]	[0.018]
Leverage	-0.668^{**}	-0.645^{*}	-0.672^{*}
	(0.047)	(0.064)	(0.062)
	[−0.061]	[−0.059]	[−0.06]
Return on assets	−0.146	−0.165	−0.163
	(0.426)	(0.402)	(0.398)
	[−0.013]	[−0.015]	[−0.015]
Constant	−0.017	−0.467	−0.482
	(0.979)	(0.570)	(0.536)
Industry effect	Yes	Yes	Yes
No. of obs	668	668	668
Pseudo R-square	0.063	0.065	0.071

Table 4: Post-listing cash savings

This table reports the results showing the effect of capital raised on post-listing cash savings for RTO firms and IPO firms. Panel A reports the results of OLS regressions. Panel B reports the results of regressions estimated on the propensity-score matched sample. Panel C reports the results of regressions estimated using Heckman two-step method. The dependent variable Y is $\Delta\text{Cash}_t = \ln[1 + (\text{Cash}_t - \text{Cash}_0)/\text{Total Assets}_0]$. Capital Raised $= \ln[\text{Capital Raised}/\text{Total Assets}_0]$. Year 0 is the year prior to listing, and t = 1, 2, 3 year after listing. All regressions include year and industry dummies. Industry dummies are created according to the Fama-French 12 industries classification. For the sake of brevity, we do not report the coefficients on the year and industry dummies as well as the coefficients on the log of total assets and the log of total funds. All variables are defined in Appendix I. Standard errors are robust to heteroskedasticity. *p*-values are reported in parentheses. Column (1) under the section "Test of equality" contains the p-value of a χ^2 test of statistical equality of the coefficients on Capital Raised in both the RTO and IPO regressions. Column (2) contains the *p*-value of a F-test of jointly statistical equality of all coefficients in each RTO and IPO regression in year t. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

		RTO			IPO			Test of equality	
Panel A: Post-listing cash savings estimated by OLS									
Y	t	Obs	Capital Raised	adj. R-sq	Obs	Capital Raised	adj. R-sq	(1)	(2)
ΔCash	1	73	0.456**	0.673	747	0.832***	0.688	0.025**	0.000***
			(0.026)			(0.000)			
	2	73	0.233	0.592	747	0.599***	0.499	0.031**	0.000***
			(0.235)			(0.000)			
	3	73	0.082	0.567	747	0.434***	0.434	0.043	0.000
			(0.678)			(0.000)			
Panel B: Post-listing cash savings on the propensity-score matched sample									
Y	t	Obs	Capital Raised	adj. R-sq	Obs	Capital Raised	adj. R-sq		
ΔCash	1	68	0.428	0.358	68	0.905***	0.591	0.061*	0.000***
			(0.155)			(0.000)			
	2	68	−0.246	0.242	68	0.716***	0.322	0.000***	0.000***
			(0.380)			(0.001)			
	3	68	−0.496**	0.282	68	0.530***	0.383	0.000***	0.000***
			(0.040)			(0.009)			
Panel C: Post-listing cash savings estimated by Heckman two-step method									
Y	t	Obs	Capital Raised	Lambda	Obs	Capital Raised	Lambda		
ΔCash	1	73	0.411***	0.301	747	0.813***	−0.621**	0.079*	0.000***
			(0.002)	(0.450)		(0.000)	(0.026)		
	2	73	0.056	1.060**	747	0.536***	−1.490**	0.030**	0.000***
			(0.762)	(0.041)		(0.000)	(0.023)		
	3	73	−0.142	1.545**	747	0.367***	−1.698**	0.012**	0.000***
			(0.506)	(0.017)		(0.001)	(0.024)		
Panel D: Post-listing cash savings estimated by Heckman two-step method (including high P/V and high V/B dummy)									
Y	t	Obs	Capital Raised	D_HIGH_P/V × Capital Raised	D_HIGH_V/B × Capital Raised	Lambda	Obs	Capital Raised	D_HIGH_P/V × Capital Raised	D_HIGH_V/B × Capital Raised	Lambda		
ΔCash	1	73	0.169	0.244	0.091	0.330	747	0.754***	0.092**	0.090*	−0.278	0.066*	0.000***
			(0.523)	(0.375)	(0.659)	(0.421)		(0.000)	(0.049)	(0.051)	(0.207)		
	2	73	−0.614	0.907*	−0.407	1.779**	747	0.415***	0.240***	0.130	−0.945**	0.116	0.000***
			(0.230)	(0.066)	(0.316)	(0.029)		(0.000)	(0.005)	(0.127)	(0.016)		
	3	73	−0.784	0.904	−0.486	2.262**	747	0.225**	0.301***	0.112	−1.164**	0.104	0.000***
			(0.209)	(0.148)	(0.348)	(0.028)		(0.024)	(0.004)	(0.287)	(0.016)		

Table 5: Post-listing business expansion

This table reports the results estimating the use of funds on business expansion in post-listing years. Panel A reports the results of OLS regressions. Panel B reports the results of regressions estimated using Heckman two-step method. Panel C reports the results of regressions estimated on the propensity-score matched sample. The dependent variable $Y_t = \ln[1 + (\sum_{\tau=1}^{t} V_\tau / \text{Total Assets}_0)]$ for V = capital expenditure (CAPEX) or acquisitions, $Y_t = \ln[1 + (V_t - V_0)/\text{Total Assets}_0]$ for V = total assets. Capital Raised = $\ln[\text{Capital Raised}/\text{Total Assets}_0]$. Year 0 is the year prior to listing, and t = 1, 2, 3 year after listing. All regressions include year and industry dummies. Industry dummies are created according to the Fama-French 12 industries classification. For the sake of brevity, we do not report the coefficients on the year and industry dummies as well as the coefficients on the log of total assets and the log of total funds. All variables are defined in Appendix I. Standard errors are robust to heteroskedasticity. p-values are reported in parentheses. Column (1) under the section "Test of equality" contains the p-value of a χ^2 test of statistical equality of the coefficients on Capital Raised in both RTO and IPO regressions. Column (2) contains the p-value of a F-test of joint statistical equality of all coefficients in each RTO and IPO regression at year t. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

		Panel A: Results estimated by OLS						Panel B: Results estimated by Heckman two-step method					
		RTO		IPO		Test of equality		RTO		IPO		Test of equality	
Y	t	Capital Raised	adj. R-sq	Capital Raised	adj. R-sq	(1)	(2)	Capital Raised	Lambda	Capital Raised	Lambda	(1)	(2)
Implication for growth and expansion													
ΔTotal Assets	1	0.535***	0.613	0.642***	0.714	0.496	0.000***	0.694***	−1.054*	0.648***	0.227	0.601	0.000***
		(0.005)		(0.000)				(0.001)	(0.100)	(0.000)	(0.372)		
	2	−0.031	0.520	0.313***	0.671	0.021**	0.000***	−0.006	−0.149	0.303***	−0.225	0.288	0.000***
		(0.857)		(0.000)				(0.981)	(0.840)	(0.000)	(0.447)		
	3	0.025	0.576	0.132**	0.634	0.517	0.000***	0.068	−0.295	0.116**	−0.410	0.882	0.000***
		(0.893)		(0.046)				(0.757)	(0.660)	(0.020)	(0.238)		
ΣCAPEX	1	0.172	0.730	0.071***	0.311	0.365	0.003***	0.258***	−0.567**	0.070***	−0.047	0.018**	0.001***
		(0.209)		(0.001)				(0.004)	(0.033)	(0.000)	(0.674)		
	2	0.015	0.756	0.104***	0.492	0.470	0.000***	0.075	−0.358	0.099***	−0.120	0.523	0.000***
		(0.921)		(0.005)				(0.484)	(0.248)	(0.000)	(0.467)		
	3	0.040	0.732	0.106**	0.554	0.635	0.000***	0.110	−0.480	0.101***	−0.134	0.482	0.001***
		(0.805)		(0.010)				(0.322)	(0.156)	(0.000)	(0.503)		
ΣAcquisitions	1	−0.050	0.054	0.213*	0.062	0.025**	0.000***	−0.084	0.224	0.217***	0.119	0.012**	0.000***
		(0.375)		(0.055)				(0.396)	(0.443)	(0.000)	(0.720)		
	2	−0.044	0.172	−0.045	0.100	0.988	0.000***	−0.060	0.099	−0.032	0.299	0.696	0.000***
		(0.365)		(0.419)				(0.451)	(0.675)	(0.433)	(0.280)		
	3	−0.011	0.684	−0.063**	0.029	0.153	0.000***	−0.024	0.087	−0.055**	0.211	0.612	0.000***
		(0.678)		(0.031)				(0.486)	(0.409)	(0.030)	(0.228)		
Industry dummy		Yes		Yes				Yes		Yes			
Year dummy		Yes		Yes				Yes		Yes			
Obs		73		747				73		747			

Table 5 (Continued)

		Panel C: Results on the propensity-score matched sample					
		RTO		IPO		Test of equality	
Y	t	Capital Raised	adj. R-sq	Capital Raised	adj. R-sq	(1)	(2)
Implication for growth and expansion							
ΔTotal Assets	1	0.703*	0.297	0.750***	0.656	0.890	0.000***
		(0.089)		(0.000)			
	2	−0.306	0.213	0.383**	0.690	0.010***	0.000***
		(0.304)		(0.027)			
	3	−0.191	0.278	0.077	0.665	0.383	0.000***
		(0.587)		(0.651)			
ΣCAPEX	1	0.130	0.252	0.076**	0.363	0.594	0.000***
		(0.294)		(0.027)			
	2	−0.045	0.166	0.028	0.534	0.728	0.000***
		(0.856)		(0.770)			
	3	−0.079	0.210	0.021	0.626	0.647	0.000***
		(0.751)		(0.863)			
ΣAcquisitions	1	−0.166	0.045	0.357	0.242	0.014**	0.000***
		(0.136)		(0.166)			
	2	−0.126	0.169	−0.094	0.000	0.798	0.000***
		(0.144)		(0.496)			
	3	−0.057	0.702	−0.015	0.000	0.320	0.000***
		(0.250)		(0.434)			
Industry dummy		Yes		Yes			
Year dummy		Yes		Yes			
Obs		68		68			

Table 6: Certification effect to internal capital providers

This table reports the results estimating the use of funds on business expansion in post-listing years. Panel A reports the results of OLS regressions. Panel B reports the results of regressions estimated using Heckman two-step method. Panel C reports the results of regressions estimated on the propensity-score matched sample. The dependent variable $Y_t = \ln[1 + (\sum_{\tau=1}^{t} V_\tau / \text{Total Assets}_0)]$ for $V =$ dividends and reduction in long-term debt . Capital Raised $= \ln[\text{Capital Raised}/\text{Total Assets}_0]$. Year 0 is the year prior to listing, and t = 1, 2, 3 year after listing. All regressions include year and industry dummies. Industry dummies are created according to the Fama-French 12 industries classification. For the sake of brevity, we do not report the coefficients on the year and industry dummies as well as the coefficients on the log of total assets and the log of total funds. All variables are defined in Appendix I. Standard errors are robust to heteroskedasticity. p-values are reported in parentheses. Column (1) under the section "Test of equality" contains the p-value of a χ^2 test of statistical equality of the coefficients on Capital Raised in both RTO and IPO regressions. Column (2) contains the p-value of a F-test of joint statistical equality of all coefficients in each RTO and IPO regression at year t. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

		Panel A: Results estimated by OLS						Panel B: Results estimated by Heckman two-step method					
		RTO		IPO		Test of equality		RTO		IPO		Test of equality	
Y	t	Capital Raised	adj. R-sq	Capital Raised	adj. R-sq	(1)	(2)	Capital Raised	Lambda	Capital Raised	Lambda	(1)	(2)
Implication for financial policy													
ΣDividend	1	-0.085^{**}	0.561	-0.004	0.021	0.013^{**}	0.000^{***}	-0.064^{**}	-0.136^{*}	-0.002	0.072^{**}	0.105	0.000^{***}
		(0.039)		(0.144)				(0.010)	(0.065)	(0.645)	(0.032)		
	2	-0.336^{**}	0.612	-0.006	0.054	0.002^{***}	0.000^{***}	-0.285^{***}	-0.301	-0.001	0.121^{**}	0.031^{**}	0.000^{***}
		(0.016)		(0.338)				(0.000)	(0.136)	(0.930)	(0.023)		
	3	-0.300^{**}	0.562	-0.017	0.075	0.007^{***}	0.000^{***}	-0.224^{***}	-0.519^{**}	-0.011	0.142^{**}	0.144	0.000^{***}
		(0.023)		(0.122)				(0.004)	(0.030)	(0.264)	(0.040)		
ΣLong-term Debt Reduction	1	-0.369^{**}	0.592	0.023	0.154	0.002^{***}	0.059^{*}	-0.270^{***}	-0.663^{**}	0.016	-0.267^{**}	0.068^{*}	0.002^{***}
		(0.021)		(0.256)				(0.005)	(0.018)	(0.346)	(0.026)		
	2	-0.397^{**}	0.595	-0.019	0.287	0.004	0.055	-0.325^{***}	-0.432^{*}	-0.036	-0.397^{**}	0.091^{*}	0.007^{***}
		(0.014)		(0.484)				(0.000)	(0.081)	(0.179)	(0.023)		
	3	-0.435^{***}	0.586	-0.027	0.333	0.002^{***}	0.012^{**}	-0.354^{***}	-0.561^{*}	-0.044	-0.433^{**}	0.056^{*}	0.016^{**}
		(0.006)		(0.487)				(0.000)	(0.061)	(0.120)	(0.025)		
Industry dummy		Yes		Yes				Yes		Yes			
Year dummy		Yes		Yes				Yes		Yes			
Obs		73		747				73		747			

Table 6 (Continued)

		Panel C: Results estimated on the propensity-score matched sample					
		RTO		IPO		Test of equality	
Y	t	Capital Raised	adj. R-sq	Capital Raised	adj. R-sq	(1)	(2)
Implication for financial policy							
ΣDividend	1	0.010	0.234	−0.021	0.000	0.049**	0.000***
		(0.450)		(0.169)			
	2	0.000	0.265	−0.048	0.000	0.166	0.000***
		(0.987)		(0.279)			
	3	−0.014	0.212	−0.078	0.070	0.227	0.000***
		(0.426)		(0.242)			
ΣLong-term Debt Reduction	1	0.041*	0.106	0.021	0.000	0.553	0.000***
		(0.091)		(0.558)			
	2	0.021	0.162	0.005	0.000	0.777	0.000***
		(0.626)		(0.937)			
	3	−0.048	0.035	−0.044	0.006	0.971	0.000***
		(0.612)		(0.747)			
Industry dummy		Yes		Yes			
Year dummy		Yes		Yes			
Obs		68		68			

Table 7: Certification effect to external equity providers
This table shows the post-listing analyst coverage and follow-on equity issuance activities of RTO and IPO firms. In Panel A, we present the coverage of listing firms by the I/B/E/S database and the proportion of listing firms conducting follow-on equity issuance in the post-listing years. Two-sample *t*-tests are conducted to test the significance of the differences in means. In Panel B, we report the results of logistic regressions examining how the choice of RTO versus IPO affects the post-listing follow-on equity issuance activities and analyst coverage. *Follow-on issuance* is a binary variable equals 1 if the firm raises additional capital through follow-on equity issuance during the 3-year period following listing, and 0 otherwise. *Analyst Coverage* is a binary variable equals 1 if the firm is covered by the I/B/E/S database during the 3-year period following listing, and 0 otherwise. Control variables included in the regressions but unreported for brevity are log(Total Assets), Return on assets, Capital intensity, Leverage and Cash. Industry effect is based on the Fama-French 12 industries classification. All variables are defined in Appendix I. Standard errors are robust to heteroskedasticity and within year and industry clustering. p-values are reported in parentheses. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

Panel A: Post-listing analyst coverage and follow-on equity issuance activities					
	t	RTO	IPO	Difference	t-statistics
Analyst coverage (%)	1	32.88%	42.70%	9.83%	1.63
	2	45.21%	52.61%	7.40%	1.21
	3	52.05%	54.75%	2.70%	0.44
	$1-3$	63.01%	66.27%	3.25%	0.56
Average number of analysts	1	0.49	1.14	0.64	2.34**
	2	0.92	1.53	0.61	1.90*
	3	0.97	1.83	0.85	2.23**
	$1-3$	0.79	1.50	0.70	2.28**
Follow-on equity issuance (%)	1	49.32%	23.43%	−25.89%	−4.89***
	2	23.29%	27.31%	4.02%	0.74
	3	23.29%	27.98%	4.69%	0.86
	$1-3$	63.01%	52.21%	−10.80%	−1.77*
		747	73		

Panel B: Regression analysis of the certification effect to external equity providers		
Dependent variable:	Follow-on issuance	Analyst coverage
Panel B1: Logistic regressions		
RTO dummy	0.302	0.059
	(0.301)	(0.849)
Obs	820	820
Pseudo R-square	0.064	0.166
Panel B2: Regressions estimated using Heckman two-step method		
RTO dummy	1.302	2.569
	(0.348)	(0.144)
Inverse mills ratio	−0.468	−1.314
	(0.513)	(0.161)
Obs	805	805
Pseudo R-square	0.051	0.155
Panel B3: Regressions estimated on the propensity-score matched sample		
RTO dummy	−0.060	0.224
	(0.919)	(0.700)
Obs	136	136
Pseudo R-square	0.122	0.286
Control variables	Yes	Yes
Year effect	Yes	Yes
Industry effect	Yes	Yes

Table 8: Post-listing operating performance
This table reports the OLS regression estimates of post-listing operating performance. The dependent variable is the adjusted post-listing three-year average operating performance. The RTO dummy equals 1 if a firms goes public by a RTO and 0 if it goes public by an IPO. Coefficients for year dummies are omitted for the sake of brevity. Standard errors are robust to heteroskedasticity and within year clustering. p-values are reported in parentheses. * indicates significance at 10%; ** indicates significance at 5%; *** indicates significance at 1%.

Dependent variable	Post-listing Adj. *OPCF/TA*	
	Model 1	Model 2
Pre-listing Adj. *OPCF/TA*	0.250***	0.252***
	(0.000)	(0.000)
RTO dummy		0.081
		(0.103)
Constant	0.029***	0.029***
	(0.000)	(0.000)
Year effect	Yes	Yes
No. of obs	272	272
R-squared	0.374	0.379

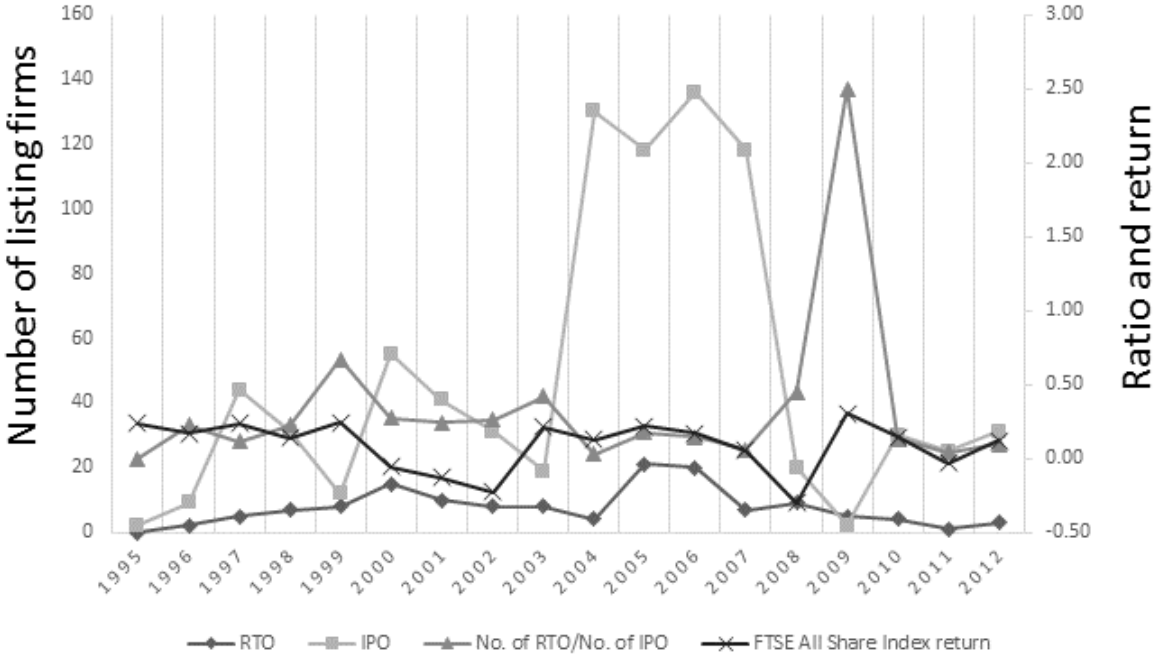

Figure 1: Time distribution of IPOs and RTOs from 1995 to 2012

Appendix I: Definitions of variables

Variable	Definition
Total assets	Book value of assets
Return on assets	Operating income before depreciation/total assets
Asset turnover	Sales/Total assets
Cash	Cash/Total assets
Leverage	Long-term debt/Total assets
CAPEX	Capital expenditures/Total assets
Market-to-book	(total assets − book equity + market value of equity − deferred taxes) / total assets
Capital intensity	Tangible assets/Total assets
Dividend	Dividends paid to common and preferred shareholders/Total assets
Long-term debt reduction	The amount of cash spent to retire long-term debt.
Acquisitions	The amount of cash spent on acquisitions.
Total funds	The sum of funds from operations, sale of property, plant, and equipment, long-term debt issuances, and sale of common and preferred stock
Capital raised	The product of the number of primary shares and the offer price.
Adj. OPCF	In each year, a firm's operating cash flow performance is adjusted by the median value of firms in each Fama-French 12 industry.
-3 months Market return	The buy-and-hold return of the FTSE All-Share Index during 3-month prior to listing.
-6 months Market return	The buy-and-hold return of the FTSE All-Share Index during 6-month prior to listing.
-12 months Market return	The buy-and-hold return of the FTSE All-Share Index during 12-month prior to listing.
-6 to -4 months Market return	The buy-and-hold return of the FTSE All-Share Index during 4 to 6 months prior to listing.
-12 to -7 months Market return	The buy-and-hold return of the FTSE All-Share Index during 7 to 12 months prior to listing.
P/V ratio	Price-to-residual-income ratio as a proxy of market misvaluation, which is estimated as in Dong et al. (2006) and Lee et al. (1999).
V/B ratio	Residual income value relative to book value of equity, which is used as a proxy of growth opportunity.
Implied P/V and V/B ratio	The P/V and V/B ratio of recently listed firms that is from the same Fama-French 12 industry and is closest in size with the sample firm.
Analyst coverage (%)	The proportion of sample firms are covered by the I/B/E/S analysts in post-listing years.
Average number of analysts	The average number of analysts for the firm in the I/B/E/S database.
Follow-on equity issuance (%)	The proportion of sample firms issue equity in post-listing years.

Table A1: Reverse takeover process and disclosure requirements

Step 1: Preparation
- Hire reverse takeover advisor (usually investment banks) - Find a suitable public firm as target - Prepare required documents for application
Step 2: Negotiation and due diligence
- Perform due diligence on the public firm - Negotiate and get approval by the public firm's shareholders
Step 3: Conduct the transaction
- Exchange of shares: above 50% of the shares of the newly combined firm to be held by the private target firm - Replacement of the management team - Name change
Step 4: Apply for readmission
- Prepare a prospectus - Prepare full accounting disclosures - Submit all other documents and information as FCA required - Promote shares if the firm tends to issue equity