Research in International Business and Finance 51 (2020) 101084

Contents lists available at ScienceDirect

Research in International Business and Finance

journal homepage: www.elsevier.com/locate/ribaf

The dynamics of earnings management in IPOs and the role of venture capital

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ARTICLE INFO

JEL classification:
G24
G30
M41

Keywords:
Earnings management
IPO
Venture capital

ABSTRACT

We investigate the dynamics of earnings management (EM) in IPOs and the role of venture capitalist (VC) in hampering such practice. We study the behavior of EM in four phases: Pre-IPO, IPO, Lock-up and Post-lock-up. We find that VC-sponsored firms tend to do more EM in the Pre-IPO period, and less in two subsequent periods. These results are distinct for those of Wongsunwai (2013), for which, VC-sponsored firms do less EM only in the IPO period. We also find that VC and non-VC-sponsored firms do EM around the IPO in distinct fashions. Non-VC-sponsored firms inflate earnings during the IPO period and deflate in the Lock-up and Post-lock-up periods. VC-sponsored firms inflate earnings in the Pre-IPO period and deflate earnings only in the Lock-up period. Our results are robust with respect to how one measures EM and the statistical methods used.

1. Introduction

This paper examines the role of venture capital-sponsorship (VC-sponsorship) in hampering earnings management (EM) in IPOs. EM is a wide variety of changes in financial reporting that affects an entity's earnings, not motivated by the need to represent the reality intrinsic to the business. Although not illegal, EM can distort the information content of the financial statements in a way that can harm shareholders. The IPO process gives entrepreneurs both motivation and opportunities to engage in EM. If earnings were artificially inflated, investors who are unaware of this procedure can be lead to pay an artificially high price. There is high information asymmetry between investors and issuers at the time of the IPO. Prospectuses are the main source of information for IPOs. However, prospectuses usually contain financial statement for only some few quarters preceding the IPO. Consequently, investors cannot rely on historical data to estimate the extent to which firms engage into EM at the time of the IPO. Thus, managers of issuing firms have both the opportunity and the motivation to manipulate earnings in order to inflate offering price. Several authors studied EM at the time of public offerings. Teoh et al. (1998b) relate the poor long-term return of IPOs detected by Ritter (1991) to EM. They find that EM around the IPO is higher for IPO issuers as compared to non-issuing firms.

VCs have incentives to force their invested firms to adopt good corporate governance practices. Kaplan and Strömberg (2002) document that VCs impose complex control rights when they sponsor a company, and put in place strong monitoring and advisory mechanisms. Hellmann and Puri (2002) find that VC-sponsorship is related to a variety of professionalization measures, such as the adoption of stock options plans, the hiring of a marketing or sales vice-president and the formulation of human resources policies.

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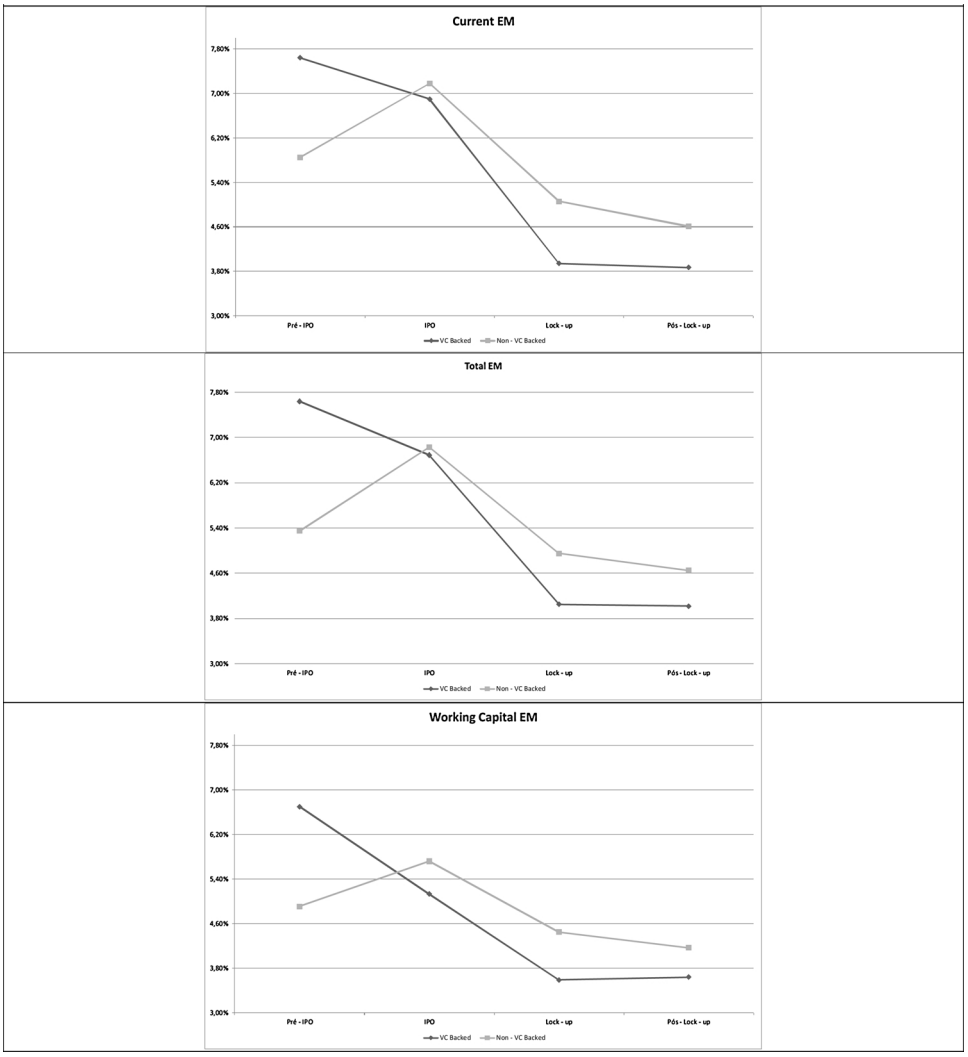
https://doi.org/10.1016/j.ribaf.2019.101084
Received 8 January 2019; Received in revised form 9 August 2019; Accepted 11 August 2019
Available online 15 October 2019



Graph 1. Earnings management across de periods of the IPO: VC and Non-VC IPOs.

They also find that VC-sponsored start-ups are more likely and faster to replace the founder with an outsider CEO. Gompers (1995) and Lerner (1995) also provide evidence of strong monitoring activity exerted by VCs (Graph 1).

VCs have incentives to force their invested firms to keep good corporate governance practices even after the IPO. Frequently, VCs do not exit their portfolio firms at the IPO. They retain their equity position for years after the IPO (Barry et al., 1990). As they systematically take firms to the IPO market, concerns with their reputation may lead them to hamper EM. Furthermore, given their financial sophistication, VCs activity in the board of directors and audit committee may constrain the propensity of managers to engage in EM (Xie et al., 2003). Thus, one expects that VCs have an important role in hampering EM in IPOs.

Hochberg (2012) studied the role of VCs in the EM behavior of IPO issuers. Using a sample of IPOs and annual data, he finds evidence that VC backed IPOs present reduced EM. Under the same setting, Morsfield and Tan (2006) show that Hochberg's result is robust to controls such as the endogenous choice for VC financing, IPO lock-up provisions, and VC exit subsequent to the IPO. However, for using annual data, these authors were unable to capture the dynamics of EM and most likely underestimated it. This is so because earnings inflation and subsequent reversal can occur in the same fiscal year. Thus, EM may not be detectable in the annual reports. This undetected pattern may be relevant because the phase in which EM occurs is related to different goals in terms of market manipulation. For example, while high EM in the Pre-IPO and IPO periods are beneficial to insiders (investors and VCs), EM in the Lock-Up period may also be important for the underwriter. Thus, the dynamics of EM is very important.

Wongsunwai (2013) is the only study that focuses on the dynamics of EM and the role of VCs in such dynamics. He *claims*[1] that VC-backed IPOs present significantly less EM than non-VC backed ones in the IPO period and that this effect is mostly due to the influence of highly reputed VCs. In the other phases of the IPO (Pre-IPO, Lock-up and Post-lock-up), VC sponsorship plays no role in

[1] We say that he claims because we believe that the conclusions that he presents do not follow from his

EM. We say that he "claims" (instead of saying "shows'), because his conclusions do not follow from his empirical analysis (in the next section, we discuss this in details)

This article evaluates the role of VC-sponsorship in reducing EM at the time of the IPO. We base our conclusion on two extensive panel datasets. One covering IPO from 1990 to 2009 and the other, financial statements from 1989 to 2011. We use three different measures of EM (Current, Working-capital and Total) and three statistical methods (pooled OLS, and firms random and fixed effects). Thus, our analysis is deeper than Wongsunwai's: our data set more extensive than his dataset that covers only from 1990 to 2004; we use more measures of EM (he analyses only Current EM); and we use more powerful methods (he does not use firms random and fixed effects).

Our empirical results are five-fold. First, we show that, considering all periods of the IPO together, VC-backed IPOs present less EM than their non-VC counterparts. Second, we show that, in the Pre-IPO period, VC-sponsored firms do more EM than Non-VC-sponsored ones, but less in the following three periods. Finally, in examining the dynamics of EM for VC-sponsored firms, we find that they also manage earnings. They inflate earnings in the Pre-IPO period, and deflate in the subsequent periods. The biggest deflation occurs from the IPO to the Lock-up period. Thus, our results are distinct for those of Wongsunwai (2013), according to which, VC-sponsored firms do less EM only in the IPO period (and no difference in the other periods).

This paper is organized as follows: Section 2 reviews previous research on this topic. Section 3 describes our methodology and explains our hypotheses, regressions models and treatment for endogenous choice of venture capital investments. Section 4 describes our sample and basics descriptive statistics. Section 5 presents empirical results. Finally, Section 6 concludes the paper.

2. Related literature

EM may have several motivations such as influencing the terms of contracts, regulators, and equity prices. Various models analyze the incentives for EM in different contexts. In general, these models use proxies for EM that are based on accruals; i.e., difference between reported earnings and cash flow from operations. Even though positive accruals suggest that reported earnings are greater than the cash flow generated by the company's operations, positive accruals by themselves are not evidence of EM. In firm's daily operations, some accrual adjustments are consistent with the accrual basis accounting regime, and sometimes appropriate and necessary to provide a good picture of earnings. EM occurs when managers discretionarily increase or decrease accruals with other purposes than to express the real economic and financial situation of the business. Therefore, it is necessary to decompose accruals into non-discretionary (normal) accruals, which are derived from the company's activities, and discretionary accruals, which are artificial and have the only intention of manipulating results. Several methodologies have been developed to make such decomposition, e.g., Healy (1985); DeAngelo (1986); Jones (1991); Dechow et al. (1995); Kang and Sivaramakrishanan (1995) and Kothari et al. (2005). These procedures are similar to an event study: one uses operational/financial characteristics of the firm to predict normal (non-discretionary) accruals. Abnormal accruals (EM) are then estimated as the difference between observed and non-discretionary accruals.

Earnings are likely to be observed right before a public offering as an effort to increase offering price (Rangan, 1998). However, inflated earnings can last longer: insiders usually have their shares blocked during the lock-up period and may want to sell some of them at the end of this period. This would extend the length of time over which managers have the incentive to keep earnings inflated. Adding to this, concerns with reputation may prevent firms that inflated earnings before the IPO to make the reversion right after it. Therefore, one would expect to observe EM not only immediately before the IPO, extending possibly until the end of the lock-up period.

Some studies have analyzed the influence of venture capital in the practice of earnings manipulation. Morsfield and Tan (2006), show that the VC effect holds even when controlling for IPO lock-up provisions, VC partial cashing out subsequent to the IPO, and alternative proxies for EM. These authors perform many sensitivity tests, such as control for the endogenous choice of VC financing, IPO lock-up provisions and VC exits subsequent to the IPO. The main results remain unchanged after all tests. Additionally, they find evidence that the post-issue performance of VC-backed companies exceeds that of the non-venture-backed ones, using both accounting measures of performance and stock returns. However, their results indicate that the best performance occurs only when the VCs are effective in mitigating EM at the time of the IPO.

It is worthwhile emphasizing that both Morsfield and Tan (2006), and Hochberg (2012) are based use cross-section data from the annual financial statements of the companies in the year of the IPO. However, annual data may underestimate EM. Earnings inflation and posterior reversal could occur inside the same fiscal year.

Chahine et al., 2012 examine the extent to which agency conflicts within VC syndicates lead to additional agency conflicts within the IPO issuer. They do their analysis in two distinct institutional contexts (UK and US). Using a matched sample of 274 VC-backed IPOs in the US and the UK, they show that the diversity of a VC syndicate increases EM, and that the impact of such diversity is higher in the US.

Finally, Wongsunwai (2013) extends previous analysis of the role of VC in the dynamics of EM around the IPO. This is accomplished with the use of quarterly data on EM, to avoid the possibility of EM not being captured when earnings inflation and deflation within the same accounting year. He uses the following econometric model

$$EM_{i,t} = \beta_0 + \beta_1 PreIPO_{i,t} + \beta_2 IPO_{i,t} + \beta_3 Lockup_{i,t} + \beta_4 VC_i + \beta_5 VC_i \times PreIPO_{i,t} + \beta_6 VC_i \times IPO_{i,t} + \beta_7 VC_i \times Lockup_{i,t} + \beta_8 Controls_{i,t} + \varepsilon_{i,t}$$

One should note that there is an overlap between variables VC and its interactions with the phases of the IPO. Thus, the effect of

Table 1
Definitions of variables.

DATA i: indicates the COMPUSTAT code for the entry *i*.	
Discretionary Current Accruals	[[ΔCurrent Assets (DATA 4)- ΔCash and Short-Term Investments (DATA 1)]-[Δ Current Liabilities (DATA 5)-ΔDebt in Current Liabilities (DATA 34)]]/Lagged Total Assets (DATA 6)
Discretionary Total Accruals	[[ΔCurrent Assets (DATA 4)- ΔCash and Short-Term Investments (DATA 1)]-[Δ Current Liabilities (DATA 5)-ΔDebt in Current Liabilities (DATA 34) + Depreciation and Amortization (DATA 14)]]/Lagged Total Assets (DATA 6)
Working-capital Accruals	[[ΔCurrent Assets (DATA 4)- ΔCash and Short-Term Investments (DATA 1)]-[Δ Current Liabilities (DATA 5)-ΔDebt in Current Liabilities (DATA 34)-ΔTaxes Payable(DATA 71)]]/Average Total Assets(DATA 6)
VC	dummy variable indicating venture capital sponsorship
Top-tier	Dummy variable indicating that the Carter-Manaster index of the underwriter is bigger than 8. We use the Carter-Manaster index (updated for the period 2001-2010 by Ritter (2013)) of the member of the underwriting syndicate with the highest score
Big-four	dummy variable indicating Big-four auditing
Size	Is the natural logarithm of book value of assets (DATA 5)
Growth	Geometric average of quarterly sales growth during the last three quarters preceding period t (or available period, if less) (from DATA 12)
Leverage	Total liabilities (DATA 181) over total assets (DATA 5)
ROA	Geometric average return on assets between quarters t-3 and t-1, calculated as the ratio of net income (DATA 172) to total assets (DATA 5)
Technology	Dummy variable indicating technology industries as defined by Loughran and Ritter (2004).
Age	IPO year minus founding year.
SEO	Dummy variable indicating that the firm did an IPO within two years from the IPO
f_i	Industry dummies mapped to US 2-digit SIC codes when using common controls
g_t	Time dummies per quarter

VC in a particular period is given by a sum of coefficients. For instance, the difference in EM between VC- and Non-VC-sponsored firms in the Pre-IPO period is given by $\beta_4 + \beta_5$ (not by β_5, as Wongsunwai assumes). In fact, it is not possible to infer the statistical significance of $(\beta_4 + \beta_5)$ from the parameters and p-values reported for the model above. Wongsunwai (2013), observing that β_6 is negative and statistically significant and that β_4, β_5 and β_7 are not statistically significant, jumps to the wrong conclusion that VC affects EM only in the IPO period. In fact, the only conclusion possible is that VC do not affect EM in the Post-lock-up period, because β_4 is not statistically significant. Thus, his claims do not proceed from the analysis that he reports.

3. Methodology

3.1. Earnings management

We use three proxies for earnings management (EM): 1) *current EM* (discretionary changes on current accruals); *total EM* (discretionary changes on current accruals minus depreciation and amortization), and *working-capital EM* (discretionary changes current accruals plus change in taxes payable). Table 1 precisely describes these variables. One should note that EM is defined as change in accruals. Thus, one needs two consecutive quarterly financial statements to compute one quarterly observation of EM. Other studies such as Hochberg (2012); Teoh et al. (1998a), 1998b); Allen et al. (2009); and Dechow et al., 2011 use these three measures of EM.

Estimations of discretionary (or abnormal) accruals use the case study methodology. Thus, we first estimate non-discretionary (or normal accruals), using an econometric model for accruals. Then, discretionary accruals correspond to the difference between actual and non-discretionary accruals. To estimate non-discretionary accruals, we use the Modified Jones model.[2] This methodology was developed by Dechow et al. (1995) and improved by Kothari et al. (2005). Estimations could use cross-section of firms or time-series for individual firms. Subramanyan (1996) and Bartov et al. (2000) show that the superiority of cross-section over time-series. Because of this, we opt for cross-sectional analysis. Appendix A describes precisely how we calculate EM.

3.2. Phases of the IPO

Similarly to Wongsunwai (2013), we study the dynamics of EM in four periods around the IPO. The *Pre-IPO period* comprises two quarterly observations of EM coming from the three balance sheets that precede the last one before the IPO (we remind the reader that one needs two consecutive financial statements to compute one observation of EM). The *IPO period* comprises two quarterly observations. They come from three balance sheets, beginning with the one preceding the last one before the IPO, and finishing with the one quarter immediately after the IPO. The *Lock-up period* comprises four quarterly observations obtained from the five balance sheets immediately subsequent to the IPO. Finally, the *Post-lock-up period* comprises four quarterly observations immediately subsequent to the Lock-up period.

[2] For robustness purposes, we also performed our analysis using the Modified Jones model with ROA. Results are similar.

3.3. Econometric models

To test the hypothesis that VC- and non-VC-sponsored firms present distinct level of EM around the IPO, we use the following panel data model

$$EM_{i,t} = \beta_0 + \beta_1 VC_i + \beta_2 Auditor_i + \beta_3 Underwriter_i + \beta_4 SEO_i + \beta_5 Controls_{i,t} + g_t + f_i + \varepsilon_{i,t} \quad (1)$$

where,

$EM_{i,t}$ is the level of EM for firm i in period t;

VC_i, $Auditor_i$, $Underwriter_i$ and SEO_i are time-unvarying dummy variable assuming value one when the issuer is: VC-sponsored; audited by a Big-four auditor; employs a top-tier underwriter; and performed a SEO within two year from the IPO, respectively;

$Controls_{i,t}$ is a set to time-varying variables: asset size (Size), financial leverage (Leverage), sales growth (Growth), and return on assets (ROA);

g_t and f_i are time- and industry-fixed effects; and

$\varepsilon_{i,t}$ is an error term.

We estimate Model (1) using pooled OLS and firm-random effects. In both methods, we use White (1980) robust errors.

Next, we test whether VC-, as compared to Non-VC-sponsored firms, present distinct levels of EM *during each specific period of the IPO*. For that purpose, we adjust Model 1 as follows: we add interactions of VC dummy and its complement (NVC dummy) with dummies indicative of the phases of the IPO (*PreIPO*, *IPO*, *Lockup* and *Postlockup*). For instance, to test the difference in EM during the Pre-IPO period across VC- and non-VC-sponsored firms, we use the following model

$$\begin{aligned} EM_{i,t} = {} & \beta_0 + \beta_1 NVC \times IPO_{i,t} + \beta_2 NVC \times Lockup_{i,t} + \beta_3 NVC \times PostLockup_{i,t} + \beta_4 VC_i \times PreIPO_{i,t} + \beta_5 VC_i \times IPO_{i,t} \\ & + \beta_6 VC_i \times Lockup_{i,t} + \beta_7 VC_i \times PostLockup_{i,t} + \beta_8 Auditor_i + \beta_9 Underwriter_i + \beta_{10} SEO_i + \beta_{11} Controls_{i,t} + g_t + f_i + \varepsilon_{i,t} \end{aligned} \quad (2a)$$

where,

NVC_i is a dummy variable indicating Non-VC-backed IPOs.

As Model 2a omits the variable indicative of the non-VC in the Pre-IPO period, the only meaningful coefficients are β_1 and β_4. β_4 measures the difference in EM between VC- and non-VC-IPOs in the Pre-IPO period. β_1 to β_3 measure the difference in earning managements for non-VC IPOs along the periods of the IPO. The other coefficients are not interesting. For instance, $\beta_5$is meaningless because it measures the difference in EM between non-VC-sponsored firms in the Pre-IPO period and VC-sponsored firms in the IPO period. Models 2b, 2c and 2d (not spelled out) omit the interactions of non-VC with the IPO, Lock-up and Post-lock-up periods, respectively. Similarly, to study the dynamics of EM for VC IPOs across time, we include the interactions of the non-VC dummy with the four dummies indicative periods, and the interactions of the VC dummy with the dummies indicative of three of the four periods Models 2e-2 g (not spelled out). We estimate Models 2a-2 g using pooled OLS and firm-random effects. In both methods, we use White (1980) robust errors.

We can also use firms-fixed-effects study the dynamics of EM over time. For that, we adjust Models 2a-2d by eliminating the interactions of one dummy variable indicative of period with the VC and Non-VC dummies. For instance, to test simultaneously whether VC- and non-VC-firms manage earnings differently in the Pre-IPO period (as compared to the other periods of the IPO), we use the following model

$$\begin{aligned} EM_{i,t} = {} & \beta_0 + \beta_1 NVC \times IPO_{i,t} + \beta_2 NVC \times Lockup_{i,t} + \beta_3 NVC \times PostLockup_{i,t} + \beta_4 VC_i \times IPO_{i,t} + \beta_5 VC_i \times Lockup_{i,t} \\ & + \beta_6 VC_i \times PostLockup_{i,t} + \beta_7 Auditor_i + \beta_8 Underwriter_i + \beta_9 SEO_i + \beta_{10} Controls_{i,t} + g_t + f_i + \varepsilon_{i,t} \end{aligned} \quad (3a)$$

Under firm-fixed effects, the other coefficients reflect within-group differences in EM. For instance, β_1 measures the change in EM for non-VC-sponsored firms between the Pre-IPO and IPO periods. Similarly, β_4 measures the change in EM for VC-sponsored across the same periods. Models (3b), (3c) and (3d) (not spelled out) omit the interactions with the IPO, Lock-up and Post-lock-up periods. In estimating Models 3a-3d, we use White (1980) robust errors.

Econometric techniques that ignore the endogenous choice problem yield substantially different (and incorrect) estimates from methods that explicitly recognize selectivity (LaLonde, 1986). It would be ideal if we could observe the VC-backed and non-VC-backed EM for the same IPO. In other words, if the provision of venture financing were random, we could simply compute differences between EM of VC backed and non-VC-backed IPOs. However, the decision of a firm to raise venture capital funds (and the decision of a venture capitalist to provide financing to a particular firm) is endogenous. Firm characteristics may determine which firms are VC-backed in the first place. Even if VC-backed had no effect on EM, the control for VC-sponsorship in regression models of EM would still make sense, because VC-sponsored firms are possibly those that were *ex ante* less likely to engage in EM (Hochberg, 2012). To partly account for this bias, we use propensity score matching method that the endogeneity of VC-sponsorship. As suggested by Lee and Wahal, 2004, we match firms based on two-digit SIC code, IPO calendar year, state in which the headquarter is located, and Top-tier underwriting (a dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8). We must highlight that propensity score models account for selection based on observables. Consequently, we may still have issues due to selection on unobservables, as discussed by Chemmanur et al. (2011).

3.4. Controls for firms' heterogeneity

We use several variables to control for firm's heterogeneity. $Auditor_i$: a dummy variable indicating Big-Four auditing (KPMG, PricewaterhouseCoopers, Deloitte Touche Tohmatsu and Ernst & Young); $Underwriter_i$: the Carter-Manaster index[3] (updated for the period 2001–2010 by Ritter, 2013) of the member of the underwriting syndicate with the highest score; $Size_{i,t}$ is the natural logarithm of total assets of firm i at quarter t (in millions of reais); $Growth_{i,t}$ is the change in net operating revenues between quarters $t-1$ and t for firm i, scaled by the net operating revenues in quarter $t-1$; $Leverage_{i,t}$: the firm i's leverage at quarter t, calculated as one minus the ration between book value of equity and book value of assets; $ROA_{i,t}$: return on assets between quarters $t-1$ and t for firm i, calculated as the ratio of net income to total assets measured at t; and $SEO_{i,t}$: a dummy variable that takes value one if the firm i in the sequence conducted a seasoned equity offering (SEO), and the quarter t falls in the range considered with incentives for earnings manipulation concerning this new equity offering, and zero otherwise. Table 1 lists these variables.

Variables $Auditor_i$ and $Underwriter_i$ control for the effect that key external monitors can have on constraining EM. According to Morsfield and Tan (2006), the reputation of the external auditor could be harmed if it failed to identify or prevent accounting misstatements. Because of this, we expect a negative sign for variable $Auditor_i$. The underwriters have the same incentives as the auditors to ensure the quality of financial statements since they can also suffer serious reputation damage if they are incapable of avoiding earnings manipulation. Thus, we also anticipate a negative coefficient for variable $Underwriter_i$.

Regarding the financial variables, Hochberg (2012) argues that large companies have more complex financial statements, and, therefore, large firms could exploit this feature to manage earnings. On the other hand, large firms are likely to be closely followed by security analysts, reducing the opportunities for EM. Thus, there is no clear expectation for the sign associated to variable $Size_{i,t}$. Hochberg (2012) also states that higher growth companies may be more likely to experience high discretionary accruals, especially if the decomposition model used contains some degree of imprecision. For this reason, we expect a positive sign for $Growth_{i,t}$. Morsfield and Tan (2006) argue that highly leveraged companies have incentives to manipulate earnings upwards in order to avoid covenant default, but also faces greater monitoring from debt holders. Thus, there is no well-defined expectation regarding the sign of $Leverage_{i,t}$. Dechow et al. (1995) suggest that tests of EM may be incorrectly specified if discretionary accruals are correlated with firm performance. $ROA_{i,t}$ controls for this potential bias and there is no specific expectation for the sign of its coefficient. Finally, the inclusion of variable $SEO_{i,t}$ seeks to control for the influence that a new equity offering could exercise on the level of EM. In the same way as in the IPO, firms have incentives to manipulate earnings when carrying out a SEO (Teoh et al., 1998a; Rangan, 1998). Thus, we anticipate a positive sign for this variable.

4. Data

Our sample covers IPOs from 1990 to 2009.[4] To compute EM in the four periods of the IPO, we need quarterly financial statements covering one year before and two years following the IPO. Thus, financial statements cover the period 1989 to 2011.

Quarterly financial statement data and information on Big-Four auditing come from COMPUSTAT. Data on IPO come from the new issues database of Securities Data Corporation (SDC-Platinum). We complemented and corrected SDC-Platinum dataset following suggestions from Ritter (2014). Information on VC-sponsorship comes from Venture Economics. As measure for underwriter quality, we use the Carter and Manaster index (1990) updated by Loughran and Ritter (2004).

As usual, we delete financial and utilities firms, and real-estate investment trusts (REITs), because these firms use accounting practices quite distinct from other companies. Our final sample consists of 3816 IPOs, comprising 37,388 firm-quarter observations on EM. This sample decomposes into 1617 VC-sponsored IPOs (15,722 firm-quarter observations), and 2199 non-VC-sponsored IPOs (21,666 firm-quarter observations). Table 2, Panel A describes how the sample breaks into VC- and non-VC-sponsored firms, as well as across the four periods of the IPO. The sample splits evenly across subsamples of VC and non-VC IPOs in all periods. As expected, the Pre-IPO period has the smallest sample, because firms do not have to present financial reports in this period. Panel B compares our samples to those of Ritter (2014) and Wongsunwai (2013). Because we cover a larger period, our sample is considerably larger than that of Wongsunwai (2013). However, as we drop several types of IPOs, our sample is smaller than that of Ritter (2014). The representativeness of VC in our sample (43%) is in between the samples of Ritter (2014) and Wongsunwai (2013), 39 and 50% respectively.

Table 3 presents descriptive statistics. VC-, as compared to Non-VC-sponsored firms are more likely to have Top-tier underwriting (80.7 versus 64.6%) and Big-four auditing (40.5 versus 35.5%), younger (9.32 versus 27.15 years), more focused on technology (45.9 versus 21.3%); smaller (107 versus 407 US$ mi), less financially leveraged (37.9 versus 56.1%). They also present higher growth rate (72.3 versus 53.0%), and similar level of ROA (0.944 versus 0.996) and probability of performing an SEO within two years from the IPO (3.8 versus 3.9%).

Table 4 reports correlation among the explanatory variables. In general, correlations are quite low, although almost all

[3] This ranking varies from 1.1 to 9.1. When none of the IPO underwriters in the syndicate was included in the international ranking, we attributed value 1.1.

[4] If one extended the dataset up to the most recent period, it would be possible to include IPOs until 2016 (one needs two years forward in accounting data). Jay Ritter's IPO dataset lists 6,208 IPOs between 1990 and 2016, and 5,387 between 1990 and 2009. Thus, by not including IPOs between 2010 and 2016, one misses 821 IPOs which represents only 13% of the total (821/6,208). Thus, based on the potential sample increase it is unlikely that one would find a radical change in results, if included the 2010-2016 period.

Table 2
Panel A: Sample Distribution across the periods of the IPO.

Period	All firms		VC		Non-VC	
	IPOs	N (firm-quarters)	IPOs	N (firm-quarters)	IPOs	N (firm-quarters)
Pre-IPO	660	1021 (2.73%)	247	305 (1.94%)	413	716 (3.30%)
IPO	3511	8136 (21.76%)	1,496	3490 (22.2%)	2.015	4646 (21.4%)
Lock-up	3721	14,075 (37.65%)	1,568	5980 (38.0%)	2,153	8095 (37.6%)
Post-lock-up	3714	14,156 (37.86%)	1,571	5947 (37.8%)	2,143	8209 (37.9%)
All periods	3816	37,388 (100%)	1617	15,722 (100%)	2199	21,666 (100%)

Panel B: Comparing samples

	Ritter (2014)	Wongsunwai (2013)	Our sample
IPOs	5650	1226	3816
VC	2215 (39%)	613 (50%)	1617 (43%)
Period	1990–2012	1990–2004	1990–2011

VC venture capital sponsorship *Pre-IPO period*: two quarterly observations, from the three balance sheets that precede the last one before the IPO); *IPO period*: two quarterly observations, from three balance sheets beginning with the one precede the last one before the IPO, and finishing with the one immediately after the IPO; *Lock-up period*: four quarterly observations, immediately subsequent the IPO period; and *Post-lock-up period*: four quarterly observations immediately subsequent to the Lock-up period. The sample consists of 3816 IPO firms from 1990 to 2009.

Table 3
Descriptive Statistics for the Sample of IPO firms.

Variables	All firms				VC				Non-VC				t-stat
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	
Top-tier	0.714	0.452	0.000	1.000	0.807	0.395	0.000	1.000	0.646	0.478	0.000	1.000	**50.31*****
Big-four	0.376	0.484	0.000	1.000	0.405	0.491	0.000	1.000	0.355	0.478	0.000	1.000	**30.31*****
ROA	0.974	0.091	0.584	1.084	0.944	0.110	0.584	1.084	0.996	0.066	0.584	1.084	**52.51*****
Leverage	0.484	0.357	0.032	1.936	0.379	0.335	0.032	1.936	0.561	0.352	0.032	1.936	**46.37*****
Growth (%)	0.612	0.505	−0.466	2.317	0.723	0.547	−0.466	2.317	0.530	0.454	−0.466	2.317	**26.85*****
Size (US$ mi)	280	1,102	0.09	24,146	107	0,357	0.45	18,207	407	1,405	0.09	24,146	**24.28*****
Technology	0.316	0.465	0.000	1.000	0.459	0.498	0.000	1.000	0.213	0.410	0.000	1.000	**46.35*****
Age	20.52	24.64	4.00	79.00	9.37	19.05	4.00	18.00	27.15	24.20	6.00	79.00	**50.88*****
SEO	0.039	0.193	0.000	1.000	0.038	0.191	0.000	1.000	0.039	0.195	0.000	1.000	**32.78*****
Observations	37,388				15,722				21,666				

The bold values are statistically significant at the 1% level.
Top-tier: Dummy variable indicating that the Carter-Manaster index of the underwriter is bigger than 8; *Big-four*: dummy variable indicating Big-four auditing; *ROA*: net income/total assets in the second balance sheet of period *t*; *Leverage*: total liabilities over total assets in the second balance sheet of period *t; Growth:* geometric average of quarterly sales growth during the last three quarters preceding period *t* (or available period, if less); and *Size*: book value of assets in the second balance sheet of period *t*; *Technology*: indicates technology industries as defined by Loughran and Ritter (2004); *Age*: IPO year minus founding year; and *SEO*: dummy indicating that the firm did and SEO within 2 years from the IPO. The t-statistics refer to the test of the null hypothesis of no difference between the means of VC- and non-VC samples. *** denotes statistical significance at the 1% level (two-tailed).

correlations are statistically significant at the 1% level. As already seen in Table 3, VC-, when compared to non-VC IPOs, present higher proportion of Top-tier underwriting and Big-four auditing. Variables Big-four and Top-tier have high correlation indicating that firms that choses highly reputed auditors also tend to choose highly reputed underwriters. Large firms tend to hire reputed underwriters and present higher ROA. Finally, firms that hire Big-four auditors are less financially leveraged.

5. Empirical results

We begin with univariate analysis. Table 5, Panel A reports mean averages of our three measures of EM (Current, Total and Working-capital) across our sample and the subsamples of VC- and Non-VC-sponsored IPOs. For the full sample (Panel A), the mean level of EM varies from 4.37% to 5.07% depending on the model used (one should remember that EM is measured as change in discretionary accruals as proportion of percentage of total assets). Furthermore, these averages are not statistically different from zero. For VC-sponsored IPOs, the average EM ranges from 4.02% to 4.69%; and for Non-VC-sponsored ones, from 4.64% to 5.37% (none of these averages is statistically different from zero). However, when one compares VC- to non-VC-backed firms, a small, but statistically significant, difference emerges. The difference in EM across these groups range from 0.40% to 0.59% and all of these differences are statistically significant at the 1% level. This is consistent with the hypothesis that the presence of VC hampers the practice of EM in IPOs.

Table 4
Correlation matrix for explanatory variables.

	VC	Top-tier	Big-four	ROA	Leverage	Growth	Size	Technology	Age
Top-tier	**0.17*****								
Big-four	**0.05*****	**0.08*****							
ROA	**−0.23*****	**0.07*****	**0.03*****						
Leverage	**−0.26*****	0.01	**−0.04*****	**0.03*****					
Growth	**0.11*****	**0.02*****	0.01	**−0.05*****	**−0.09*****				
Size	**−0.14*****	**0.45*****	**0.11*****	**0.26*****	**0.11*****	0.01			
Technology	**0.26*****	**0.07*****	0.01	**0.07*****	**−0.15*****	0.06	**−0.09*****		
Age	**−0.27*****	**0.09*****	0.03	**0.18*****	**0.20*****	**−0.12*****	**0.32*****	**−0.16*****	
SEO	0.01	**0.06*****	**0.02*****	0.01	−0.02	**0.06*****	**0.10*****	−0.01	0.02

The bold values are statistically significant at the 1% level.
VC: dummy variable indicating venture capital sponsorship; *Top-tier*: dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8; *Big-four*: dummy variable indicating Big-four auditing; *SEO*: dummy indicating that the firm did and SEO within 2 years from the IPO; *ROA*: net income/total assets in the second balance sheet of period *t*; *Leverage*: total liabilities over total assets in the second balance sheet of period *t; Growth:* geometric average of quarterly sales growth during the last three quarters preceding period *t* (or available period, if less); and *Size*: book value of assets in the second balance sheet of period *t*. *** denotes statistical significance at the 1% level (two-tailed).

Table 5
Earnings management across venture and non-venture-sponsored IPOs.

Panel A: all periods altogether

Earnings management	Full Sample			VC			Non-VC			VC minus Non-VC
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	
Current	37,388	5.07%	6.75%	15,722	4.64%	6.39%	21,666	5.37%	6.98%	**−0.59%*****
Total	33,455	5.02%	6.53%	14,058	4.69%	6.29%	19,397	5.25%	6.69%	**−0.40%*****
Working-capital	34,205	4.37%	5.42%	14,638	4.02%	5.09%	19,567	4.64%	5.65%	**−0.56%*****

Panel B: across periods of the IPOs

Earnings management	Sample	Pre-IPO		IPO		Lock-up		Post-lock-up	
		N	Mean	N	Mean	N	Mean	N	Mean
Current	All IPOs	1,021	6.39%	8136	7.06%	14,075	4.59%	14,156	4.30%
	VC	305	7.64%	3490	6.90%	5980	3.94%	5947	3.87%
	Non-VC	716	5.85%	4646	7.18%	8095	5.06%	8209	4.61%
	VC minus Non-VC	**1.79%*****		**−0.80%*****		**−1.12%*****		**−0.74%*****	
Total	All IPOs	932	6.03%	7212	6.77%	12,606	4.57%	12,705	4.39%
	VC	279	7.64%	3086	6.69%	5357	4.05%	5336	4.02%
	Non-VC	653	5.35%	4126	6.83%	7249	4.95%	7369	4.65%
	VC minus Non-VC	**2.29%*****		**−0.14%*****		**−0.90%*****		**−0.63%*****	
Working-Capital	All IPOs	933	5.46%	7571	5.46%	12,900	4.08%	12,801	3.94%
	VC	286	6.70%	3310	5.13%	5578	3.59%	5464	3.64%
	Non-VC	647	4.91%	4261	5.72%	7322	4.45%	7337	4.17%
	VC minus Non-VC	**1.79%*****		**−0.59%*****		**−0.86%*****		**−0.53%*****	

The bold values are statistically significant at the 1% level.
Descriptive statistics and mean tests for the level of earnings management of a sample of 3816 IPO from 1990 to 2009. Earnings management is discretionary Current, Total or Working-capital accruals (as percentage of lagged total assets). Discretionary accruals obtained from the Modified Jones model. *Pre-IPO period*: two quarterly observations, from the three balance sheets that precede the last one before the IPO); *IPO period*: two quarterly observations, from three balance sheets beginning with the one precede the last one before the IPO, and finishing with the one immediately after the IPO; *Lock-up period*: four quarterly observations, immediately subsequent the IPO period; and *Post-lock-up period*: four quarterly observations immediately subsequent to the Lock-up period. The t-statistics refer to the test of the null hypothesis of no difference between the mean EM in venture and non-venture-backed companies. *** denotes statistical significance at the 1% level (two-tailed).

Panel B presents the data divided into the four phases of the IPO process. On average, the three measures of EM are higher in the Pre-IPO and IPO periods as compared to the Lock-up and Post-Lock-up periods. Furthermore, VC-backed firms present higher level of EM in the Pre-IPO period, but lower in the other periods.

Next, we test whether VC-sponsorship hampers EM considering the periods of the IPO altogether. Table 6 presents estimations of Model 1. Similar to the univariate analysis, we find evidence that VC-backed firms present lower levels of EM than non-VC-backed ones, regardless of how one measures EM (Current, Total or Working-capital), or the econometric method –pooled ordinary least squares (OLS) or random effects (RE). The coefficient on VC varies from -0.004 to -0.008 and is always statistically significant at 1%.

Table 6
Effect of venture capital sponsorship on earnings management.

EM	Current		Total		Working-capital	
	OLS	RE	OLS	RE	OLS	RE
Regression	(1)	(2)	(3)	(4)	(5)	(6)
VC	**−0.007*** **	**−0.008*** **	**−0.006*** **	**−0.007*** **	**−0.004*** **	**−0.005*** **
	(-6.31)	**(-7.15)**	**(-5.30)**	**(-5.89)**	**(-4.37)**	**(-5.21)**
Top-tier	−0.002	−0.000	**−0.002***	−0.002	0.000	0.002
	(-1.24)	(-0.20)	**(-1.77)**	(-1.11)	(0.18)	(1.61)
Big-Four	0.001	0.001	0.001	0.001	0.001	0.001
	(1.12)	(1.22)	(1.12)	(1.20)	(0.64)	(0.97)
ROA	**−0.038*** **	**−0.036*** **	**−0.048*** **	**−0.040*** **	**−0.015** **	−0.009
	(-5.21)	**(-4.52)**	**(-6.03)**	**(-4.82)**	**(-2.44)**	(-1.52)
Leverage	**0.032*** **	**0.035*** **	**0.031*** **	**0.034*** **	**0.035*** **	**0.038*** **
	(14.60)	**(14.74)**	**(13.46)**	**(13.90)**	**(16.75)**	**(18.29)**
Growth	**0.016*** **	**0.014*** **	**0.014*** **	**0.013*** **	**0.010*** **	**0.009*** **
	(14.67)	**(13.35)**	**(13.37)**	**(11.83)**	**(11.96)**	**(10.97)**
Size	**−0.010*** **	**−0.010*** **	**−0.008*** **	**−0.008*** **	**−0.009*** **	**−0.010*** **
	(-19.86)	**(-18.78)**	**(-16.57)**	**(-14.66)**	**(-21.74)**	**(-22.46)**
Technology	−0.000	0.000	−0.001	0.000	0.001	**0.002***
	(-0.29)	(0.21)	(-0.36)	(0.29)	(0.84)	**(1.72)**
Ln(1 + Age)	**−0.000*** **	**−0.000*** **	**−0.000*** **	**−0.000*** **	−0.000	−0.000
	(-3.04)	**(-3.24)**	**(-2.87)**	**(-3.55)**	(-1.25)	(-1.56)
SEO	**0.014*** **	**0.014*** **	**0.012*** **	**0.012*** **	**0.006*** **	**0.006*** **
	(6.17)	**(6.26)**	**(5.46)**	**(5.65)**	**(3.83)**	**(3.85)**
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Clusters	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Eff.	Yes	Yes	Yes	Yes	Yes	Yes
# of IPOs	3816	3816	3614	3614	3708	3708
Observations	37,146	37,146	33,276	33,276	33,990	33,990
Adjusted R2	0.1047	0.1043	0.1080	0.1013	0.1290	0.1162

The bold values are statistically significant at the 1% level.
Panel regressions analysis. The dependent variable is earnings management (EM) for firm i in the quarter t as percentage of the total assets. Earnings management is discretionary Current, Total or Working-capital accruals (as percentage of lagged total assets). Discretionary accruals obtained from the Modified Jones model. *VC*: dummy variable indicating venture capital sponsorship; *Top-tier*: dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8; *Big-four*: dummy variable indicating Big-four auditing; *ROA*: net income/total assets in the second balance sheet of period *t*; *Leverage*: total liabilities over total assets in the second balance sheet of period *t; Growth:* geometric average of quarterly sales growth during the last three quarters preceding period *t* (or available period, if less); *Size*: book value of assets in the second balance sheet of period *t*; *Technology*: indicates technology industries as defined by Loughran and Ritter (2004); *Age*: IPO year minus founding year; and *SEO*: dummy indicating that the firm did and SEO within 2 years from the IPO. Total sample covers IPOs from 1990 to 2009. *OLS*: pooled ordinary least squares. *RE*: firms' random effects. t-statistics heteroskedastic-consistent by White (1980) are in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels (two-tailed).

For instance, the coefficient on VC in Regression 1 (Current EM and OLS) is -0.007 indicating that changes in discretionary current accruals as proportion of the total assets is 0.7% smaller for VC- than Non-VC-sponsored firms.

One should note that control variables present statistical significance and sign consistent with the expected. EM increases with financial leverage and growth rate, and decreases with size. The coefficients on variables Leverage, Growth and Size are statistically significant at 1%. The coefficient on the Leverage ranges from 0.031 to 0.038; on the Growth, from 0.009 to 0.016 and on Size, from -0.008 to -0.010. We also find that older and more profitable firms present lower levels of EM. The coefficient on ROA and Age are statistically significant at 1%, with the exception of Working-capital EM (Regression 7 and 8). The coefficient on ROA varies from -0.009 to -0.048. Even though statistically significant, the coefficient on Ln (1 + Age) is close to zero. Contrary to what we expected, certification plays no role in hampering EM: in all regressions, variables Top-tier and Big-four fail to present statistical significance. Finally, firms performing an SEO within two years from the IPO present increased levels of EM. The coefficient on SEO is always statistically significant at 1%, varying from 0.006 to 0.014. Thus, our results are consistent with Morsfield and Tan (2006); Hochberg (2012); Rangan (1998) and Wongsunwai (2013).

Now, we turn into whether the effect of VC-sponsorship in reducing EM is uniform or varies across the periods of the IPO. Table 7 presents estimations for Model 2a. As explained in the methodology section, Model 2a includes all interactions of VC dummy and its complement (NVC dummy) with dummies variables indicative of the periods of the IPO (PreIPO, IPO, Lockup and Postlockup), with the exception of the interaction of Non-VC and the PreIPO. There are two coefficients of interest in Table 7. The coefficient on the interaction of VC and the PreIPO period is positive everywhere, but statistically significant at 10% level only for Total EM (OLS and RE, Regressions 4 and 5) and Working-capital EM (RE, Regression 8). This indicates that VC-sponsored firms tend to do more EM in the Pre-IPO period. However, one should be careful with this statement, because of the small number of firms for which was possible to compute EM in the Pre-IPO period. The coefficient on NVC-IPO is everywhere positive and statistically significant at the 1% level,

Table 7
Effect of venture capital sponsorship on earnings management during the Pre-IPO period.

EM	Current		Total		Working-capital	
	OLS	RE	OLS	RE	OLS	RE
Regression	(1)	(2)	(3)	(4)	(5)	(6)
NVC-IPO	**0.011*****	**0.008*****	**0.013*****	**0.010*****	**0.009*****	**0.008*****
	(3.67)	**(2.74)**	(4.24)	**(3.35)**	**(3.44)**	**(3.23)**
NVC-Lockup	**−0.006****	**−0.010*****	−0.002	**−0.006****	0.002	0.000
	(-2.03)	**(-3.44)**	(-0.81)	**(-2.12)**	(0.59)	(0.10)
NVC-Postlockup	**−0.009*****	**−0.013*****	−0.004	**−0.008*****	−0.001	−0.002
	(-3.20)	**(-4.69)**	(-1.53)	**(-2.88)**	(-0.26)	(-0.82)
VC-PreIPO	0.006	0.006	**0.011***	**0.011***	0.009	**0.009***
	(1.00)	(0.96)	**(1.75)**	**(1.80)**	(1.62)	**(1.68)**
VC-IPO	0.006	0.003	**0.008****	**0.006***	0.004	0.003
	(1.63)	(0.94)	**(2.28)**	**(1.67)**	(1.24)	(1.10)
VC-Lockup	**−0.017*****	**−0.020*****	**−0.012*****	**−0.015*****	**−0.005***	**−0.006****
	(-5.39)	**(-6.69)**	**(-3.84)**	**(-4.91)**	**(-1.88)**	**(-2.46)**
VC-PostLockup	**−0.017*****	**−0.021*****	**−0.012*****	**−0.015*****	**−0.006***	**−0.007*****
	(-5.52)	**(-6.92)**	**(-3.76)**	**(-4.92)**	**(-1.92)**	**(-2.60)**
Top-tier	**−0.003****	**−0.004*****	**−0.004*****	**−0.005*****	−0.000	0.000
	(-2.35)	**(-2.70)**	**(-2.64)**	**(-3.15)**	(-0.35)	(0.26)
Big-four	0.001	0.001	0.001	0.001	0.001	0.001
	(1.37)	(1.28)	(1.33)	(1.29)	(0.83)	(0.98)
ROA	**−0.032*****	**−0.038*****	**−0.042*****	**−0.041*****	−0.008	**−0.011***
	(-4.33)	**(-4.89)**	**(-5.25)**	**(-5.08)**	(-1.23)	**(-1.72)**
Leverage	**0.029*****	**0.030*****	**0.028*****	**0.030*****	**0.033*****	**0.037*****
	(12.94)	**(12.60)**	**(11.98)**	**(11.97)**	**(15.57)**	**(17.11)**
Growth	**0.014*****	**0.012*****	**0.013*****	**0.011*****	**0.009*****	**0.008*****
	(12.90)	**(11.03)**	**(11.96)**	**(9.95)**	**(10.89)**	**(9.51)**
Size	**−0.008*****	**−0.008*****	**−0.008*****	**−0.007*****	**−0.009*****	**−0.009*****
	(-17.43)	**(-14.97)**	**(-14.49)**	**(-11.62)**	**(-20.33)**	**(-20.18)**
SEO	**0.011*****	**0.011*****	**0.010*****	**0.010*****	**0.005*****	**0.005*****
	(5.02)	**(5.27)**	**(4.41)**	**(4.78)**	**(2.86)**	**(3.13)**
Ln(1 + Age)	**−0.000****	**−0.000*****	**−0.000****	**−0.000*****	−0.000	−0.000
	(-2.14)	**(-3.01)**	**(-2.12)**	**(-3.41)**	(-1.01)	(-1.43)
Technology	−0.001	−0.000	−0.001	−0.000	0.001	0.001
	(-0.53)	(-0.24)	(-0.64)	(-0.06)	(1.25)	(1.49)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Time and industry fixed eff.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Clusters	Yes	Yes	Yes	Yes	Yes	Yes
# of IPOs	3816	3816	3614	3614	3708	3708
Observations	37,146	37,146	33,276	33,276	33,990	33,990
Adjusted R2	0.1054	0.1025	0.0965	0.0957	0.1099	0.1032

The bold values are statistically significant at the 1% level.
The dependent variable is earnings management (EM) for firm i in the quarter t as percentage of the total assets. Earnings management is discretionary Current, Total or Working-capital accruals. Discretionary accruals obtained from the Modified Jones model. *PreIPO*: two quarterly observations, from the three balance sheets that precede the last one before the IPO); *IPO*: two quarterly observations, from three balance sheets beginning with the one precede the last one before the IPO, and finishing with the one immediately after the IPO; *Lockup*: four quarterly observations, immediately subsequent the IPO period; and *Postlockup*: four quarterly observations immediately subsequent to the Lock-up period. *VC*: dummy variable indicating venture capital sponsorship; *Top-tier*: dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8; *Big-four*: dummy variable indicating Big-four auditing; *ROA*: net income/total assets; *Leverage*: total liabilities over total assets*; Growth:* geometric average of quarterly sales growth during the last three quarters preceding period *t* (or available period, if less); *Size*: book value of assets. *Technology*: indicates technology industries as defined by Loughran and Ritter (2004); *Age*: IPO year minus founding year; and *SEO*: dummy indicating SEO within 2 years from the IPO. Total sample covers IPOs from 1990 to 2009. *OLS*: pooled ordinary least squares. *RE*: firms' random effects. t-statistics heteroskedastic-consistent by White (1980) are in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels (two-tailed).

ranging from 0.008 to 0.013. This result indicate that non-VC-sponsored firms increases EM from the Pre-IPO to the IPO period. The results for the control variables are similar to those in Table 6. Because of this, we do not discuss them here.

Table 8, Panel A presents the estimations for the differences in EM between VC- and non-VC-sponsored firms over the four periods of the IPO. The coefficients on VC-PreIPO come from Table 7 that estimates Model 2a (they are the coefficients on VC-PreIPO). The coefficients on VC-IPO comes from the estimations of Model 2b, the model that omits NVC-IPO, and so on (for this reason when commenting Table 8 we refer to columns rather than regressions). Since the coefficients on the control variables are the same, we do not report them. We have already commented the results for VC-PreIPO in the paragraphs above. Here we focus on the other periods. The results are quite strong. VC-sponsored firms do less EM than their non-VC counterparts in the IPO, Lock-up and Post-lock-up periods, regardless of the measure of EM and the statistical method used. Results are statistically significant at the 5% or 1% levels.

Table 8
Effect of venture capital sponsorship (VC) on earnings management (EM).

EM	Current			Total			Working-capital		
	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Panel A: earnings management for VC minus Non-VC-IPOs across periods									
Column	**(1)**	**(2)**		**(3)**	**(4)**		**(5)**	**(6)**	
PreIPO	0.006	0.006		**0.011***	**0.011***		0.009	**0.009***	
	(1.00)	(0.96)		**(1.75)**	**(1.80)**		(1.62)	**(1.68)**	
IPO	**−0.005****	**−0.005****		**−0.005****	**−0.004***		**−0.005*****	**−0.005*****	
	(-2.38)	**(-2.04)**		**(-2.13)**	**(-1.72)**		**(-3.00)**	**(-2.64)**	
Lockup	**−0.011*****	**−0.011*****		**−0.010*****	**−0.009*****		**−0.007*****	**−0.007*****	
	(-8.24)	**(-7.94)**		**(-7.05)**	**(-6.56)**		**(-5.78)**	**(-5.56)**	
PostLockup	**−0.008*****	**−0.008*****		**−0.008*****	**−0.007*****		**−0.005*****	**−0.005*****	
	(-6.37)	**(-6.19)**		**(-5.58)**	**(-5.28)**		**(-4.11)**	**(-4.14)**	
Panel B: the dynamics of earnings management for Non-VC IPOs									
Column	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**
IPO minus PreIPO	**0.011*****	**0.008*****	**0.009*****	**0.013*****	**0.010*****	**0.011*****	**0.009*****	**0.008*****	**0.009*****
	(3.67)	**(2.74)**	**(2.66)**	**(4.24)**	**(3.35)**	**(3.25)**	**(3.44)**	**(3.23)**	**(3.20)**
Lockup minus IPO	**−0.017*****	**−0.017*****	**−0.014*****	**−0.015*****	**−0.016*****	**−0.012*****	**−0.008*****	**−0.008*****	**−0.006*****
	(-11.33)	**(-11.76)**	**(-7.98)**	**(-9.88)**	**(-10.33)**	**(-6.43)**	**(-6.41)**	**(-6.50)**	**(-3.99)**
PostLockup minus Lockup	**−0.003*****	**−0.004*****	0.001	**−0.002****	**−0.002****	**0.003****	**−0.002*****	**−0.002*****	0.000
	(-3.70)	**(-3.84)**	(0.90)	**(-2.21)**	**(-2.30)**	**(2.29)**	**(-2.85)**	**(-2.81)**	(0.24)
Panel C: the dynamics of earnings management for VC IPOs									
Column	**(16)**	**(17)**	**(18)**	**(19)**	**(22)**	**(21)**	**(22)**	**(23)**	**(24)**
IPO minus PreIPO	−0.001	−0.003	**−0.013***	−0.003	−0.006	**−0.018*****	−0.005	−0.006	**−0.014****
	(-0.09)	(-0.49)	**(-1.91)**	(-0.57)	(-1.02)	**(-2.67)**	(-1.05)	(-1.22)	**(-2.55)**
Lockup minus IPO	**−0.023*****	**−0.023*****	**−0.006****	**−0.020*****	**−0.021*****	**−0.005****	**−0.009*****	**−0.009*****	−0.001
	(-13.19)	**(-13.78)**	**(-2.38)**	**(-11.45)**	**(-12.01)**	**(-2.18)**	**(-6.82)**	**(-7.16)**	(-0.79)
PostLockup minus Lockup	−0.000	−0.001	**0.004****	0.000	−0.000	**0.002***	−0.000	−0.000	**0.002***
	(-0.48)	(-0.77)	**(2.54)**	(0.14)	(-0.14)	**(1.68)**	(-0.17)	(-0.47)	**(1.82)**

The bold values are statistically significant at the 1% level.
Panel regressions analysis. The dependent variable is earnings management (EM) for firm i in the quarter t as percentage of the total assets. Earnings management is discretionary Current, Total or Working-capital accruals (as percentage of lagged total assets). Discretionary accruals obtained from the Modified Jones model. *PreIPO*: two quarterly observations, from the three balance sheets that precede the last one before the IPO); *IPO*: two quarterly observations, from three balance sheets beginning with the one precede the last one before the IPO, and finishing with the one immediately after the IPO; *Lockup*: four quarterly observations, immediately subsequent the IPO period; and *Postlockup*: four quarterly observations immediately subsequent to the Lock-up period. *VC*: dummy variable indicating venture capital sponsorship; *Top-tier*: dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8; *Big-four*: dummy variable indicating Big-four auditing; *SEO*: dummy indicating that the firm did and SEO within 2 years from the IPO; *ROA*: net income/total assets in the second balance sheet of period *t*; *Leverage*: total liabilities over total assets in the second balance sheet of period *t; Growth:* geometric average of quarterly sales growth during the last three quarters preceding period *t* (or available period, if less); and *Size*: book value of assets in the second balance sheet of period *t*. Total sample covers IPOs from 1990 to 2009. *OLS*: pooled ordinary least squares. *RE*: firms' random effects. *FE*: firms' fixed-effects. t-statistics heteroskedastic-consistent by White (1980) are in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels (two-tailed).

The difference is stronger in the Lock-up period. For instance, focusing on Current EM (Columns 1 and 2), the difference is -0.011 in the Lock-up versus -0.005 in the Pre-IPO, and -0.008 in the Post-lock-up period (for both, OLS and RE).

For Robustness purposes, we also estimate the differences in EM between VC- and non-VC-sponsored firms over the four periods of the IPO using propensity score matching (PSM). Table 9 report our PSM analysis. Qualitatively, the results are the same as in Panel A of Table 8: VC-sponsored firms do more EM than Non-VC-sponsored ones in the PreIPO period, but less in all the following periods. However, the results under PSM are stronger in terms of both magnitude and statistical significance. Consider, for instance, the difference between groups during the Pre-IPO period. Under regression analysis, it ranges from 0.006 to 0.011, not statistically significant for Current EM and only marginally significant for Total and Working-capital EM. Under PMS, it ranges from 0.017 to 0.024 and is always statistically significant at the 1% level

So far, we analyzed whether VC-sponsored firms do more or less EM than Non-VC counterparts in each specific period of the IPO. Now, we analyze the dynamic of EM to understand whether VC and non-VC-sponsored firms manage earnings along time, i.e., whether they change their EM policy along the periods of the IPO. Table 7 presents estimations of Model 2a. In all regressions, the coefficients on NVC-IPO is positive and statistically significant at the 1% level. This means that regardless of how one measures EM or the econometric method, estimations indicate that non-VC sponsored firms manage earnings from the Pre-IPO to the IPO period. For example, the coefficient of 0.011 on NVC-IPO for Current EM under OLS (Regression 1) indicates that non-VC sponsored firms increase Current EM from the Pre-IPO to the IPO period by 1.1%.

Panels B and C of Table 8 report the full dynamics of EM for non-VC- and VC-sponsored issuers. In Panel B, the coefficients for "IPO minus PreIPO" under OLS and RE are the same as the coefficients for NVC-IPO in Table 7 (as explained above). As in Panel A, the

Table 9
Analysis of earnings management (EM) by propensity score matching (earning management for VC minus non-VC firms by periods of the IPO).

EM	Current	Total	Working-capital
All periods	**−0.008***** **(10.47)**	**−0.006***** **(7.83)**	**−0.007***** **(10.37)**
Pre-IPO	**0.018***** **(2.84)**	**0.024***** **(3.69)**	**0.017***** **(3.21)**
IPO	**−0.005**** **(2.14)**	**−0.003**** **(2.25)**	**−0.007***** **(4.31)**
Lock-up	**−0.012***** **(11.08)**	**−0.010***** **(8.68)**	**−0.009***** **(9.68)**
Post-Lock-up	**−0.007***** **(7.25)**	**−0.006***** **(5.85)**	**−0.005***** **(5.48)**

The bold values are statistically significant at the 1% level.
*** denotes statistical significance at the 1% level (two-tailed).
Match with reposition based on the two-digit SIC code, IPO calendar year, state in which the headquarter is located, and underwriter ranking (dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8). Earnings management is discretionary Current, Total or Working-capital accruals (as percentage of lagged total assets). Discretionary accruals obtained from the Modified Jones model. *PreIPO period*: two quarterly observations, from the three balance sheets that precede the last one before the IPO); *IPO period*: two quarterly observations, from three balance sheets beginning with the one precede the last one before the IPO, and finishing with the one immediately after the IPO; *Lockup period*: four quarterly observations, immediately subsequent the IPO period; and *Postlockup period*: four quarterly observations immediately subsequent to the Lock-up period. t-statistics are in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels (two-tailed).

remaining coefficients of Panels B and C come from non-reported regressions. One should remember that firms fixed effects (FE) also yields estimates for the difference in EM across periods for a same group of IPOs (Models 3a to 3d).

The results for the dynamics of EM among non-VC-sponsored firms (Panel B) are strong and consistent across measures of EM and econometric methods. Non-VC-sponsored firms increase EM from the Pre-IPO to the IPO period and deflates earnings in the two following periods. For example, focusing on Current EM and OLS (Column 7), non-VC-sponsored firms increase EM by 11% from the Pre-IPO to the IPO period; and decrease EM by 1.7% from the IPO to the Lock-up period, and by 0.3% from the Lock-up to the Post-lock-up period. This same patter repeats for other measures of EM and econometric method: strong inflation of earnings from the Pre-IPO to the IPO period, strong deflation from the IPO to the Lock-up period, and mild deflation from the Lock-up to the Post-lock-up period. With some few exceptions, the coefficients are statistically significant at the 1% level.

Table 8, Panel C reports the dynamics of EM for VC-sponsored firms. The results are quite distinct from those for non-VC-sponsored firms, and varies depending on the econometric method. Under OLS and RE, the only statistically significant variation in EM occurs from the IPO to the Lock-up period: near 2% for Current and Total (Columns 16, 17), and near 0.9% for Working-Capital EM (Columns 22 and 23). There is no statistically significant variation in EM from the Pre-IPO to the IPO, and from the Lock-up to the Post-lock-up period. The results under FE are stronger in terms of both, magnitude and statistical. FE estimations indicates that VC-sponsored firms change EM policy in all periods, regardless of how it is measured.

Overall, our results for the dynamics of EM indicate that both VC and non-VC-sponsored firms manage earnings around the IPO, but in distinct fashions. Non-VC-sponsored firms inflate earnings during the IPO period and deflate in the Lock-up and Post-lock-up periods. VC-sponsored firms inflate earnings (if they inflate at all) in the Pre-IPO period and deflate earnings only in the Lock-up period.

6. Conclusion

Earnings management is related with a wide variety of practices that affect a firm's reported earnings with any intention other than to represent the reality intrinsic to the business. Previous studies show that firms manage their earnings in the process of going public. Some studies find that, for IPO issuers, EM is associated with the reputation of the auditor and underwriter, existence of an audit committee, leverage, growth opportunities and firm size. Some other studies pointed out the role of VC in hampering EM at the time of the IPO. Some studies that use annual data. However, annual data do not capture EM, if earnings are inflated and subsequently deflated within a same accounting year. Furthermore, annual data annual data do not allow the analysis of the dynamics of EM, i.e., detect in each moments earnings are inflated and subsequently deflated.

This article investigates the dynamics of earnings management in IPOs and the role of venture capitalists in hampering such practice in the US. By using quarterly data, we are able to investigate whether VC-sponsored firms do more or less earnings management than non-VC-sponsored firms, and how EM varies along time for each group of firms. Our analysis is based on three different measures for EM (Current, Working-capital and Total EM), an strong statistical methods (pooled OLS, and firms random and fixed effects)

We find that VC-sponsored firms tend to do more EM in the Pre-IPO period, and less in the subsequent periods (IPO, Lock-up and Post-lock-up). Thus, our results are distinct for those of Wongsunwai (2013), according to which, VC-sponsored firms do less EM only

in the IPO period (and no difference in the other periods). We also find that the dynamics of EM varies across groups of firms. Both VC and non-VC-sponsored firms manage earnings around the IPO, but in distinct fashions. Non-VC-sponsored firms inflate earnings during the IPO period and deflate in the Lock-up and Post-lock-up periods. VC-sponsored firms inflate earnings in the Pre-IPO period and deflate earnings only in the Lockup period. Our results are robust with respect to how one measures EM and the statistical methods used.

Our results have implications for investors and policymakers. When examining financial reports of IPO issuing firms, one should consider that firms manage earnings. However, the degree and timing of earnings management is different for VC and non-VC issuers.

Funding

Carvalho acknowledges support from FAPESP (2016-06826-6). The views in this article are those of the authors and do not necessarily reflect the views of the Federal Reserve System, the Federal Reserve Bank of Cleveland, or the Board of Governors.

Appendix A. Methodology for estimating earnings management

Following Teoh et al. (1998b), we define current accruals for firm *i*at time *t*, $CAcc_{i,t}$, as:

$$CAcc_{i,t} = (CA_{i,t} - CA_{i,t-1}) - (CL_{i,t} - CL_{i,t-1}) \tag{A1}$$

where

$CA_{i,t}$ is the current assets of firm *i* at time *t*, excluding cash; and

$CL_{i,t}$ is the current liabilities of firm *i* at time *t*, excluding short-term debt.

We use three different econometric models to obtain normal (non-discretionary) accruals: *Jones Model* [Jones (1991)], *Modified Jones Model* [Dechow et al. (1995), with adjustments suggested by Kothari et al. (2005)] and *Modified Jones Model with ROA* [Dechow et al. (1995), with adjustments suggested by Kothari et al. (2005)].

For the *Jones Model*, current accruals are specified according to the following model:

$$\frac{CAcc_{i,t}}{TA_{i,t-1}} = \beta_1\left(\frac{1}{TA_{i,t-1}}\right) + \beta_2\left(\frac{(NR_{i,t} - NR_{i,t-1})}{TA_{i,t-1}}\right) + \varepsilon_{i,t} \tag{A2}$$

where

$TA_{i,t-1}$ is the total assets of firm *i* at time $t-1$; and

$NR_{i,t}$ is the net operating revenues of firm *i* at time *t*.

For the *Modified Jones Model*, current accruals are *specified* according to the following model:

$$\frac{CAcc_{i,t}}{TA_{i,t-1}} = \beta_1\left(\frac{1}{TA_{i,t-1}}\right) + \beta_2\left(\frac{(NR_{i,t} - NR_{i,t-1}) - (TR_{i,t} - TR_{i,t-1})}{TA_{i,t-1}}\right) + \varepsilon_{i,t} \tag{A3}$$

where

$TR_{i,t}$ is the trade accounting receivables of firm *i* at time *t*.

Finally, for the *Modified Jones Model with ROA*, current accruals are specified according to the following model:

$$\frac{CAcc_{i,t}}{TA_{i,t-1}} = \beta_1\left(\frac{1}{TA_{i,t-1}}\right) + \beta_2\left(\frac{(NR_{i,t} - NR_{i,t-1}) - (TR_{i,t} - TR_{i,t-1})}{TA_{i,t-1}}\right) + \beta_3(ROA_{i,t}) + \varepsilon_{i,t} \tag{A4}$$

where

$ROA_{i,t}$ is the return on assets of firm *i* at time *t*.

To compute non-discretionary current accruals for IPO firm *i* at time *t*, $NDCA_{i,t}$, we estimate the regressions above cross-sectionally for a sample (control group) of firms at quarter *t*. The control group for each quarter is formed of all firms listed on BM&FBovespa excluding: 1) financial firms and real-state investment trusts; 2) firms that trade OTC; 3) firms that had conducted either an IPO or SEO and were in the IPO or lock-up periods; 4) firms for which balance sheets were not available in the specific quarter; and 5) firms for which the accruals were in the 1st and 99th percentiles in the specific quarter (in order to minimize the influence of outliers). For instance, using the *Jones Model*, non-discretionary current accruals ($NDCA_{i,t}$) are calculated as:

$$NDCA_{i,t} = \hat{\beta}_1\left(\frac{1}{TA_{i,t-1}}\right) + \hat{\beta}_2\frac{(NR_{i,t} - NR_{i,t-1})}{TA_{i,t-1}} \tag{A5}$$

where

$\hat{\beta}_1$and $\hat{\beta}_2$are the estimated parameters from Regression (A2).

Finally, earnings management for IPO firm *i* at time *t* ($EM_{i,t}$) are calculated as the difference between $CAcc_{i,t}$ (scaled by lagged total assets) and $NDCA_{i,t}$:

$$EM_{i,t} = \frac{CAcc_{i,t}}{TA_{i,t-1}} - NDCA_{i,t} \tag{A6}$$

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