

# IPO lockups and insider trading

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## Abstract

We examine directors' and VC firms' dealings before, at and after lockup expiry from a sample of 201 UK IPOs during the period 1999-2014. We report an increase in number of IPO lockups which are allowed to prematurely lapse for some investors. Overall, directors and VC firms tend sell and purchase in contrast to the prevailing market sentiment. The exceptions are directors' purchases before expiry and VC firms' (complete) sales after expiry. Director dealings, especially purchases, produce a stronger price impact than dealings of VC firms. Among insiders, dealings of founder-CEOs generate the strongest price impact.

JEL classification: D82, G12, G14, G15, G24

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## 1. Introduction

Lockups prevent firms' insiders from selling all or some percentage of their equity during immediate post-IPO periods. While most US studies report standardised lockups of 180 days (Field and Hanka, 2001; Mohan and Chen, 2001; Brau et al., 2004), evidence from the UK markets is rather different, suggesting significant variations in lockup periods (Espenlaub et al., 2001; Hoque, 2011; Ahmad and Jelic, 2014). Prior studies on US lockups report a significant drop in prices, with average returns between -1% and -3% at lockup expiry (Brav and Gompers, 2003; Field and Hanka, 2001; Brau et al. 2004). The evidence for the UK is less conclusive. Whilst Espenlaub et al. (2001; 2014) report negative but not statistically significant price changes, Hoque and Lasfer (2009) report highly significant price changes of -1.85% during a 4 day window around lockup expiry.

Evidence on UK director dealings in seasoned (Fidrmuc et al., 2006; Friedrich et al. 2002) and IPO firms (Hoque and Lasfer, 2013) shows that on the announcement date of buy (sell) transactions, share prices tend to increase (decrease). Consistent with the literature for US firms (e.g. Lakonishok and Lee, 2001), directors in the UK follow a contrarian strategy by selling (buying) after significant share price increases (decreases). Whilst prior UK studies focus on director dealings, there is paucity of research on trades by other insiders. In this study, we analyze the stock price behavior associated with the disclosure of trades of directors and other insiders (e.g. VC firms and company founders) around the expiry of IPO lockups. In line with the information hierarchy hypothesis the information content would also depend on the type of directors. Company founders and/or CEOs should trade on more valuable information compared to other insiders (e.g. directors appointed by VC firms) and their trades should, therefore, be associated with a higher price impact.

According to UK regulation (FCA, 2014), on certain occasions, lockup commitments can be waived, cancelled or modified before the end of the lock-up agreement term with the consent of the broker. The changes to the lockup agreement often result in shorter lockups and directors and VCs selling before the originally agreed lockup expiry date. We further add to the literature by examining directors' and VC firms' dealings prior to lockup expiry.

Our results suggest an increasing popularity for lockups with clearly defined lockup periods in terms of a calendar date, rather than in relation to various corporate events. We also

identify a significant increase in the number of IPOs where underwriters allow lockup restrictions to prematurely lapse for some investors. The number of these cases particularly increased in the post-crisis period. The mean (median) sample lock up period is 406 (365) calendar days. Lockups for VC firms tend to be shorter with a mean (median) of 219 (180) calendar days. In the majority of cases (75%), VC firms sell their locked shares in instalment, over several months after the lockup expires.

Overall, directors and VC firms tend sell and purchase in contrast to the prevailing market sentiment. The exceptions are directors' purchases before (scheduled) lockup expiry and (complete) VC firms' sales after lockup expiry. Insider trades around lockup expiry send credible signals to investors. In particular, directors' purchases (before and after scheduled lockup expiries) generate significant positive price impact. Dealings of company founder-CEOs generate the strongest price impact.

Recent reports expressed concerns about the state of the UK IPO market (Kay, 2012; Myners et al., 2014; FCA, 2017). One important concern was related to the alleged short-termism of the market and whether it offers sufficient encouragement to long term performance improvements. For example, Myners et al. (2014) highlight the importance of a long term shareholder register. Lockups and cornerstone investors are recommended as principal routes for achieving formal long term commitments.<sup>1</sup> Our results contribute to the above debate by shedding more light on changes in ownership after lockup expiry. An important issue is also whether the UK premium listing standard requires further changes. Finally, the examination of insider trading in UK companies is timely and contributes to the debate about the recently proposed changes to the Market Abuse Directive and its replacement with the Market Abuse Regulations (MAR; No.596/2014).

The remainder of this paper proceeds as follows. Section 2 summarises the literature and motivates the hypotheses. Section 3 presents the data and sample characteristics. Section 4 presents the methodology. Section 5 presents the estimated results. Robustness checks are presented in Section 6, and Section 7 concludes the paper.

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<sup>1</sup> Importance of the long term committed (i.e. anchor) IPO investors was also highlighted in recent Jumpstart Our Business Start-ups (JOBS) US policy initiative (see Dambra et al., 2015).

## 2. Literature and hypotheses

### 2.1. Market reaction to expiry of directors' and VC firms' lockups

At the time of the directors' lockup expiry, abnormal returns should on average be equal to zero since the market should be able to predict how many shares directors will sell (Allen and Postlewaite, 1984). The above conjecture is in line with the fact that information about the lockups is disclosed in IPO prospectuses and therefore is in the public domain. In an efficient market, information about lockups should be reflected in prices as soon as prospectuses are published. Evidence on UK IPOs lends support for the above hypothesis (Espenlaub et al., 2001; Hoque and Lasfer, 2009; Espenlaub et al., 2014). Espenlaub et al. (2014), for example, report negative but not statistically significant CARs during 2, 3, 4, and 7 day windows after lockup expiry. The results remain unchanged in subsamples with different types of lockups (e.g. with clear-cut expiry dates, with dates relative to earnings announcements, etc.). The authors also report higher abnormal returns for lockup expiry dates with VC backing, institutional holdings, and a higher percentage of locked shares.<sup>2</sup> Based on the above, we hypothesise:

*H1: Average abnormal returns on scheduled lockup expiry dates should be equal to zero.*

An alternative hypothesis suggests negative average abnormal returns in line with a view that director sales normally convey bad news (Field and Hanka 2001; Brau et al. 2004). Empirical evidence for US IPOs is supportive of the above hypothesis (Ofek and Richardson, 2000; Bradely et al., 2001; Brav and Gompers, 2003) and reports negative and statistically significant abnormal returns.<sup>3</sup> Downward price pressure is also enhanced by the fact that VCs distribute shares of the portfolio companies to their investors who then sell them at lockup expiry (Brav and Gompers, 2003). Field and Hanka (2001), for example, report that abnormal returns at lockup expiry and a permanent increase in trading volume after expiry tend to be three times larger in US IPOs with VC backing. Costly arbitrage is another reason why abnormal returns may vary from zero even though investors can accurately predict the number of shares coming to the market (Pontiff, 1996). Brav and Gompers (2003), for example, report high transaction costs of 6.3% on average (in terms of the bid-ask spread) for

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<sup>2</sup> It is however worth noting that the above UK studies do not examine dealings of insiders at expiry.

<sup>3</sup> Mohan and Chen (2001) is a rare study reporting zero average abnormal returns at expiry of US lockups.

transactions in the US market. The creation of short positions is also hampered by a relatively small number of floated shares in IPO firms.

## **2.2. Insider dealings and lockups**

### **2.2.1. Director and VC firms' dealings prior to lockup expiry**

Espenlaub et al. (2014) and Hoque and Lasfer (2009) both report that in 14% of cases, directors sell shares before lockup expiry.<sup>4</sup> Hoque and Lasfer (2009) also report that directors buy shares before lockup expiry in 31% of their sample IPOs.<sup>5</sup> Early sales and purchases normally occur in lockups with a length of one year or more and usually take place half way to lockup expiry.<sup>6</sup> Directors' early purchases and sales are more likely to be in VC backed IPOs and IPOs with a larger proportion of locked up shares. The authors also report that early sales occur after 40 days of positive abnormal returns preceding the trade. Sales generate significant negative abnormal returns on the announcement day and during the post-sell trade period. In contrast, early purchases occur after significant negative returns and generate positive and significant event date returns. The information content of purchase transactions is short lived, with insignificant abnormal returns in the post-event period. The authors also suggest that early directors' trades could be encouraged by underwriters in order to extract rent.

VC investors are committed long term investors who add value via their expertise and changes in corporate governance (Cumming et al., 2007). Jain and Kini (2000) report evidence that venture capital backing contributes positively to post IPO survival. Espenlaub et al. (2016) report that Hong Kong IPOs backed by more committed investors with longer lockups stay listed longer. This is in line with evidence for a positive relation between survival rates and the length of lockup periods in UK IPOs (Ahmad and Jelic, 2014). The early VC exit could be read as a lack of commitment and therefore a bad signal to investors. This may especially be the case in companies which do not perform well and when a significant number of shares are unexpectedly unloaded into the market. We therefore

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<sup>4</sup> Espenlaub et al. (2014) examine 233 IPOs, with different types of lockups, from the Main LSE board during 1992-98. About one third of their sample IPOs had lockups with clear-cut expiry date. Hoque and Lasfer (2009) examine 831 IPOs, predominantly from the Alternative Investment Market (AIM), with different types of lockups during 1999-2007.

<sup>5</sup> Field and Hanka (2001) and Brav and Gompers (2003) report early sales in 17% and 15% of their US sample IPOs, respectively.

<sup>6</sup> 80% of their sample with early purchases and sales is during the period 2004 to 2006.

hypothesise that the premature exercise of lockups can take investors by surprise and/or provide valuable signals to them.

*H2: The average abnormal returns around dealings (purchases and sales) prior to scheduled lockup expiry should vary from zero.*

### **2.2.2. Director and VC firms' dealings at and post lockup expiry**

Directors' sales in IPOs with lockups are different from dealings in other IPOs (and indeed non-IPO companies) since the dates of lockup expiry are disclosed and known to investors. Investors, therefore, should not be surprised by sales and/or associate sales with private information. Furthermore, VC firms are expected to exit by the very nature of their business model and their sales should produce no significant price effect. In some cases, however, VC firms may not sell all of the locked shares at lockup expiry. Lasfer and Matanova (2015) for example, report that US financial sponsors maintain around 50% of equity up to three years after lockups. The decision to stagger sales of locked shares and thus to retain some ownership for a longer period may be associated with private information. We therefore expect differences in negative abnormal returns for completed (i.e. one off) and partial sales at lockup expiry.<sup>7</sup> For example, we expect that VCs' continuing involvement in the company may be considered as good news by investors. The price effect of their subsequent partial (rather than complete) sales should therefore be positive.

*H3a: The average abnormal returns following directors and VC firms' sales on (and soon after) the scheduled lockup expires should be equal to zero.*

The potential market impact of directors' purchases is less clear. For example, directors purchases at or shortly after lockup expiry could signal that they expect improved performance which would lead to a positive price effect. Purchases, however, could be motivated by directors' desire to achieve more control and benefit from non-transferable private benefits of control such as perquisites (see Dyck and Zingales 2004) or immunity to any disciplinary actions (see Morck et al. 1988). In the above scenario, a negative price impact of directors' purchases is expected. It is plausible that outside investors may be less concerned about the entrenchment in firms with active investors who perform monitoring

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<sup>7</sup> The above hypothesis is to some extent related to the size of transaction. For example, partial sales tend to be smaller than complete one-off sales.

(e.g. VC). However, if directors purchase at the same time as VC firms sell, then the market may still be concerned. If directors' purchase just after the VC firm sells then two scenarios are possible: (i) If directors already have a high percentage ownership, investors may be worried about entrenchment after the VC firm exits and the overall effect may be weaker; (ii) If directors have a low percentage ownership, the market may see their purchases as a signal of their commitment and the overall effect may be stronger. Overall, we expect that directors' purchases send credible signals to outsiders.

*H3b: The average abnormal returns following directors' purchases on (and soon after) the scheduled lockup expiry should be positive.*

### **2.2.3. Hierarchy hypothesis**

Prior studies on insider dealings highlight differences in the information content of different type of insiders (see Seyhun, 1986; Ravina and Sapienza, 2010).<sup>8</sup> For example, Seyhen (1986) find that dealings of the chairmen of the boards of directors or officer-directors are more successful predictors of future abnormal stock price than other insiders. Ravina and Sapienza (2010) report that independent directors, who sit on audit committees, earn higher returns when purchasing their company shares than other independent directors. Independent directors also earn abnormal returns when they sell company stock shortly before bad news and around earnings restatements. In line with the above results, Chen et al. (2012) report that long term returns of US IPOs tend to be negatively associated with selling by senior executives after IPO lockup expiry. The authors also report that sales by senior executives are in part motivated by private information whilst sales by other insiders are consistent with portfolio diversification. Consistent with the previous studies, we hypothesise that CEOs trade on more credible information and therefore expect a significant price reaction associated with their purchases and sales.

We further contribute to the literature by examining the price effect of company founders' dealings. The effect of founders on the performance of family-owned firms is not clear. Anderson, Duru, and Reeb (2009), for example, present two opposing hypotheses. The entrenchment hypothesis predicts worse performance in companies where founders are in

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<sup>8</sup> US studies consider senior executives as: presidents, CEO, chair of the board, officer-directors, CFO, vice president, or controlling persons (see e.g. Seyhun, 1990). Insiders are defined as officers, directors, key employees, and shareholders with more than 10% holdings in any equity class (Lakonishok and Lee, 2001).

control whilst the monitoring hypothesis predicts the opposite. The market reaction to founders' transactions therefore could be either positive or negative depending on whether investors see founders entrenched or not. IPO firms are however diffusely held firms and therefore founders are less likely to be entrenched. We therefore expect a significant price effect from both founders' purchases and sales.

In some cases company founders also perform the CEO function (i.e. founder-CEO) at the time of transactions. This group of insiders should possess superior information about the company and their dealings and therefore produce the highest price impact. We expect particularly strong negative abnormal returns for sales of founders who also perform the CEO role. The weakest market reaction is expected for VC directors' sales, given their expected exit soon after the IPO.

*H4a: Company CEOs' purchase and sales will generate statistically significant abnormal returns.*

*H4b: Founder-CEOs' sales will have strongest negative price impact.*

### **3. Data and sample characteristics**

#### **3.1. Data**

Our sample consists of all IPOs on the London Stock Exchange (LSE) Main Market between 1999 and 2014. For companies listed on the main board of the LSE, lockups are completely voluntary.<sup>9</sup> Further to restrictions stipulated in lockup agreements and published in IPO prospectuses, insider trades are also restricted by insider trading regulation.

The information on the IPO date, issue price, market capitalisation, industry and money raised is from the LSE website. We exclude IPOs from financial companies and companies incorporated outside the UK. We obtain IPO prospectuses from the Perfect Filings database

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<sup>9</sup> In the LSE's AIM, 1-year lockups are compulsory for directors, substantial shareholders and their associates, and employees in IPO firms which have not been independent and/or have not reported revenues for at least 2 year (AIM Rule 7). IPOs in the AIM are frequently including warrants in their underwriter compensation packages (see Khurshed et al., 2016).

and hand collect information on lockup agreements (expiry type<sup>10</sup>, expiry date), insider names (CEO, company founder, directors appointed by VCs), insiders ownership, VC firm(s), underwriters, primary and secondary shares offered and the percentage of shares locked up.<sup>11</sup> Daily stock prices are obtained from DataStream. We manually check all the filings of each VC backed IPO and extract the share sale announcements by all VC firms.

The regulation on insider trading existed in the UK since 1976. As a member of the European Community (EC), the UK adopted the Insider Dealing and Money Laundering Directive (89/592/EEC) in 1989. The European Market Abuse Directive (MAD) (2003/6/EC) replaced the old (1989) directive in 2003.<sup>12</sup> The Financial Conduct Authority (FCA) is the UK regulatory and supervisory authority covering the implementation of MAD. Importantly, corporate insiders are required to disclose their trades within 5 trading days. The company must also notify the LSE of the transaction and an entry should be made in the Company register within 3 working days.

Data on IPO firms is matched with data of insiders' transactions from the Directors Deals (DD) database.<sup>13</sup> The Directors Deals database covers trades of: full time executive directors and board members; former executives, former board members, and members of supervisory boards; person dispensing managerial responsibilities; non-executive directors (members of boards and/or in an advisory capacity on a part time basis). We exclude trades on all securities other than ordinary (common) and preferred shares. Transfers, option exercises, and dividend related transactions are also excluded. Our data therefore contains only pure purchase and sale transactions which are then aggregated for the same security traded on the same day. IPOs with ownership and lockup data missing from their prospectus and not matched with the Directors Deals database is excluded. In line with IPO literature, we also exclude 22 IPOs from the financial sector.<sup>14</sup> The above procedure results in 201 UK IPOs with complete data on IPO firms, lockups, PE firm transactions and director's dealings during the period 1999-2014.

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<sup>10</sup> We use Perfect filings database to find event dates in case of relative expiry lockups which are usually linked with announcements like preliminary results, publication of accounts etc.

<sup>11</sup> We consider only transactions of PE firms with more than 3% shareholdings in sample companies.

<sup>12</sup> The Transparency Directive (TD) focusing on transparency and enforcement of the existing requirements was approved in 2004 (2004/109/EG) and implemented in March 2007 (2007/14/EG).

<sup>13</sup> See <http://www.directorsdeals.com>.

<sup>14</sup> Unreported results in an extended sample with IPOs from the financial sector are economically and statistically similar to the results reported in our analysis. Results available upon request from authors.

### 3.2. Sample characteristics

We present sample descriptive statistics in Table 1. Our sample consists of 201 IPOs with lockups (Panel A). Out of 201 sample IPOs, 96 received a PE backing with an agreed lockup for PE firms. The mean (median) size (i.e. Market capitalisation) of our sample IPO is around £814 (£268) million. On average, our sample IPOs raised around £219 million. The most represented industries are the Consumer Services and Technology sectors with 40 IPOs, respectively.

**\*\*\* Insert Table 1 about here\*\*\***

The mean (median) length of lockups for directors is 406 (365) days, with a minimum and maximum lockup length of 180 and 508 days, respectively. The majority (74%) of the directors' lockups are absolute lockups with a clear cut expiry date. Around 19% of the lockups are relative lockups with expiry dates associated with the disclosure of the company's results. Relatively smaller sample IPO firms tend to agree longer lockup periods and are more likely to agree relative lockups. Finally, around 7% of the lockups are a combination of absolute and relative lockups.<sup>15</sup>

The overall number of directors' sales (908) is lower than the number of directors' purchases (1,783) (Table 1 – Panel C). This is in line with evidence reported in prior studies on (non-lockup related) director trades in the UK (Fidrmuc et al., 2006; Hoque and Lasfer, 2013), the US (Lakonishok and Lee, 2001), and European (Aussenegg et al., 2016) markets. The overall number of VC firms' sale transactions is 217 (Table 1 – Panel B).

### 4. Methodology

The empirical approach of our paper is similar to Friedrich et al. (2002) and Fidrmuc et al. (2013) in that we implicitly assume some degree of market efficiency. We therefore analyze rapid, short-term, effects of insider trades during several days before and after lockup expiry.

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<sup>15</sup> VC backed IPOs tend to have shorter lockups for VC firms compared to lockups for directors, with a mean (median) length of 219 (180) days (Panel B).

The use of daily data reduces the joint-hypothesis problem and enhances the power of statistical tests (see Friedrich et al., 2002). Using a standard event-study methodology we examine the price effect of insider trades during the period of 20 trading days before and after lockups expiry.<sup>16</sup> An estimation window of 60 trading days before the event window is used to estimate the Market model parameters. We exclude the first 30 calendar days after the IPO from our analysis. In this way we exclude effects of underpricing and (normally) highly volatile prices immediately following an IPO. We perform two parametric tests (the cross sectional t-test (see Brown and Warner, 1980) and the standardized cross sectional t-test (see Boehmer et al., 1991)) and two non-parametric tests (the Corrado rank test (see Corrado, 1985) and the generalized sign test (see Cowan, 1992)) to examine the significance of cumulative abnormal returns.

## **5. Results**

### **5.1. Market reaction to expiry of lockups**

Results of the market reaction to the expiry of directors' and VC firms' lockups are presented in Table 2. The results suggest negative and insignificant abnormal returns for both directors' and VC firms' lockup expiries.<sup>17</sup> The results are therefore in line with Espenlaub et al. (2001; 2014) and our hypothesis 1.

**\*\*\* Insert Table 2 about here \*\*\***

### **5.2. Director and VC firms' dealings prior to lockup expiry**

We present results for directors' and VC firms' dealings prior to lockup expiry in Tables 3 (Panel A) and 4 (Panel A), respectively. The number of directors' sales prior to lockup expiry is surprisingly high. For example, early director sales occurred in 17.4% of sample IPOs. This is higher than the 14% reported in Hoque and Lasfer (2009) and Espenlaub et al. (2014) respectively.<sup>18</sup> The higher number of early sales in our sample is in line with anecdotal evidence of an increase in the number of early releases from US lockups, especially after the

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<sup>16</sup> See Brown and Warner (1980); Campbell et al. (1997); MacKinlay (1997).

<sup>17</sup> Unreported results suggest that CARs remain negative and insignificant until the end of 20 day event window.

<sup>18</sup> It is also worth mentioning that Hoque and Lasfer (2009) sample ends in 2009 whilst Espenlaub et al. (2014) examine UK IPOs during the 1990s.

2007-2009 Crisis.<sup>19</sup> In 36.3% of all sample IPOs, directors purchase before originally agreed lockup expiry. This is again higher than the 31% reported in Hoque and Lasfer (2009). Early sales of VC firms occurred in 8.8% of sample IPOs (Table 4 – Panel A). As expected, we do not find evidence for any additional early purchases by VC firms.

**\*\*\*Insert Table 3 about here\*\*\***

Directors tend to purchase after negative CARs (-3.5%). The negative CARs are statistically significant, thus, in line with contrarian behaviour. Abnormal returns on the purchase announcement days are positive (1.6%) and statistically significant. CARs remain positive (6.7%) and statistically significant until the end of the event window, i.e. until the trading day +20 (see Table 3 – Panel A). Directors therefore tend to act based on private information when purchasing before the lockup dates disclosed in IPO prospectuses.

CARs before director sale announcements are positive and statistically significant, suggesting that directors tend to sell after significant price increases. On the announcement day of sales, abnormal returns are around zero (0.02%) and not statistically significant. The CARs turn negative (-1.58%) by the end of the event window. VC firms also tend to sell after significantly positive CARs (Table 4 – Panel A).<sup>20</sup> On the announcement days of VC firm sales, abnormal returns tend to be positive (0.53%) but are not statistically significant (Table 4 - Panel A). CARs remain positive (0.18%) and insignificant until trading day +20. Figures 1-Panel A and 2-Panel A highlight the contrarian behaviour of directors' and VC firms' sales prior to lockup expiry. The results suggest that both directors and VC firms try to time the market when selling their shares before the lockup dates disclosed in IPO prospectuses. Overall, the results are in line with hypothesis 2 for directors' purchases but not for directors' sales.

**\*\*\*Insert Table 4 about here\*\*\***

**\*\*\*Insert Figures 1 and 2 about here\*\*\***

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<sup>19</sup> US underwriters have allowed insiders at 11.4% of all IPOs to sell shares before lockup expirations since 2008. The reported percentage is nearly double the percentage allowed in the previous five years (The Wall Street Journal, IPO Lockups Don't Live Up to Their Name, 26 Sept 2012).

<sup>20</sup> It is worth noting lower levels of statistical significance of CARs compared to those for directors' sales, reported in Table 3-Panel A.

### 5.3. Directors' and VC firms' dealings on and post lockup expiry date

Directors tend to sell their locked shares after a significant increase in prices. Abnormal returns for directors' sales on the announcement dates are slightly positive (0.43%) but not statistically significant (Table 3 – Panel B). CARs become negative (-0.75%) (not highly statistically significant) during the next 10 days. At the end of the event window, average CARs are around zero and not statistically significant. The pronounced contrarian behaviour of directors' transactions after lockup expiry is also revealed in Figure 1 - Panel B. Overall, our results are in line with our hypothesis 3a.

We are able to compare our results for all directors trades on and after the lockup expiry dates (until the end of the sample period) (Table 3 – Panel C) with the results of directors dealing in UK IPOs and seasoned companies. For example, Hoque and Lasfer (2013) examine directors' trades in UK IPOs. They report that on the announcement date of buy trades, share price increases resulting in positive and statistically significant CARs of 3.59% (during -1 to +1 window). The effect seems to be much stronger compared to the 1.16% reported for seasoned UK firms by Fidrmuc et al. (2006). By the end of the 40-day window, Hoque and Lasfer (2013) report negative and statistically significant CARs. In our (total) sample of director purchases, abnormal returns are positive (0.96%) and statistically significant and thus more in line with the results reported in Fidrmuc et al. (2006). Interestingly, the returns increase from 0.96% on the announcement date to 5.45% at the end of the 20-day event window. Results for all directors sales (i.e. until the end of the sample period) produce negative (-0.03%) insignificant abnormal returns at the announcement date. The returns however become negative (-2.56%) and statistically significant at the end of the event window (Table 3 – Panel C). Thus, the negative price impact tends to persist. Our results for directors' sales are in line with Hoque and Lasfer (2013).<sup>21</sup>

VC firms also tend to sell their shares after an increase in price (Table 4 - Panel B). The price increase is statistically significant only at a 10% level (SCS-test) thus not providing strong support for the contrarian behaviour of PE firms. On the transaction date, abnormal returns are equal to zero. Prices temporarily increase after the announcements only to drop again, resulting in non-significant negative CARs (-1.63%) at the end of the event window. Overall,

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<sup>21</sup> Hoque and Lasfer (2013) report negative but not statistically significant abnormal returns on the sales announcements.

the results suggest that VC firms sell in order to exit their investments and are less likely to trade based on private information.

Directors tend to buy additional shares in their companies after a significant drop in price (Table 3 – Panel B). For example, CARs during the 20-day period prior to announcements are negative (-4.13%) and statistically significant. In addition, directors' purchases, post lockup expiry, generate positive (1%) and statistically significant abnormal returns on the announcement day (Table 3 - Panel B). Abnormal returns remain positive and statistically significant throughout the following 20 trading days. Our results are in line with hypothesis 3b. The results are also in line with Chen et al. (2012) who report positive CARs for directors' purchases after lockup expiry.

#### **5.4. VC firms' first and subsequent sales**

As a next step, we compare the price effects of first and subsequent VC firms' sales. As Table 5 reveals, VC firms prefer partial to complete sales. For example, when they sell for the first time after lockup expiry, PE firms tend to retain some shareholdings in around 75% of cases (43 out of 57 cases) (see Table 5 - Panel A). Similarly, in subsequent sales VC firms prefer to maintain some shareholding in 124 out of 163 cases (Table 5 - Panel B).

**\*\*\* Insert Table 5 about here \*\*\***

When VC firms sell for the first time, sales follow a significant price increase only when they sell all shares (i.e. complete exit). Results presented in Table 5 (Panel A) and Figure 3 (Panel A) highlight this contrarian behaviour. The results are opposite for subsequent sales where the contrarian behaviour is evident only for partial sales. Partial sales exhibit a significant CAR of +4.10% during the 20-trading day period prior to the announcement day (see also Figure 3 - Panel B). Whilst VC firms' first sales do not produce statistically significant CARs (Panel A), further partial sales (Panel B) tend to generate statistically significant positive CARs up to 10 days after the transactions.

**\*\*\*Insert Figure 3 about here\*\*\***

## 5.5. Hierarchy hypothesis

Results for dealings stratified by different types of insiders (founders, CEOs, and directors appointed by VC firms) are presented in Table 6. Founders clearly follow a contrarian strategy, thus selling (buying) after a significant abnormal share price increase (decrease) (see Panel B of Table 6). The contrarian behaviour of founders is however more evident for purchases than for sales.

Table 6 (Panel A) exhibits significant contrarian behaviour of CEOs when purchasing. CEOs tend to buy after an average abnormal price decrease of -5.63%. The evidence for contrarian behaviour of CEOs when selling is rather weak. Similarly, we do not find evidence for potential contrarian behaviour of VC directors.<sup>22</sup> The significant contrarian behaviour for founders (purchases and sales) and CEOs (purchases) is also revealed in Figure 4 (Panels A and B, respectively).

**\*\*\*Insert Figure 4 about here\*\*\***

CEO dealings produce the strongest impact in line with our hypothesis 4a. For example, CEO purchases produce positive and statistically significant CARs of 1.33% on the announcement day. CARs further increase thereafter, reaching a value of +8.32% at the end of the event window (see Table 6 - Panel B). Founders generate positive CARs (1.11%) on the announcement date, remaining positive and significant until the end of the event window (9.43%).

Purchases of VC directors produce a lower (not statistically significant) abnormal price impact of +0.89% on the announcement day (Table 6 – Panel C). However, by the end of the event window (i.e. until trading day +20), abnormal returns are cumulating to a significant  $CAR_{0,20}$  of +13.43%. This result could be related to the fact that further purchases by VC directors are unexpected and therefore could be associated with private information.

**\*\*\*Insert Table 6 about here\*\*\***

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<sup>22</sup> Only statistically significant CARs are those during the period preceding PE directors purchases (Corrado Rank at 5% level).

Similarly, investors consider CEO sales more important than those of founders and VC directors. For example, CEO sales exhibit a negative and statistically significant average CAR of -0.71% on the announcement dates (see Table 6 - Panel B). The CARs remain negative and highly significant until the end of the event window (-4.56%). This compares to a CAR of -3.29% at the end of the event window for founder sales (Table 6 - Panel A). VC director sales trigger a small positive (0.06%) but insignificant abnormal returns on the announcements (Table 6 - Panel C). Cumulative abnormal returns become negative (but not significant) by the end of the event window (-1.65%).

Our results for purchases of founder-CEOs, suggest positive and statistically significant CARs of 12.55% by the end of the 20-day window (Table 6 – Panel D).<sup>23</sup> The CARs are therefore higher than those reported for both our sample founders and sample CEOs, respectively. Similarly, sales of founder-CEOs result in the highest negative CARs (-5.32%) at the end of the 20-day window. The results lend support to our hypothesis 4b. Notably, founder-CEOs tend to adopt contrarian behaviour when purchasing but not when selling shares in their own companies.

## **6. Robustness checks**

### **6.1. Early trades and market reaction to lockup expiry**

We expect varying market reactions at lockup expiry in subsamples with and without early trades. For example, investors may find it easier to predict how many shares directors will sell at lockup expiry in cases where some trades happen before expiry. This may result in lower abnormal returns in the subsample with the early trades compared to the subsample where the originally agreed lockup date remains the same. The above hypothesis has not been tested before and perhaps could shed more light on inconclusive evidence reported in previous studies.

Unreported results suggest positive (but not statistically significant) CARs in the subsample with early sales.<sup>24</sup> The CARs are not significant, neither economically nor statistically, and are lower (in absolute terms) compared to the CARs in the subsample without early trades.

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<sup>23</sup> The unreported results are available upon request from authors.

<sup>24</sup> The unreported results are available upon request from authors.

The subsamples with early purchases by directors and with both early purchases and early sales, exhibit negative and insignificant CARs. The results reported in Table 2 are therefore robust to the consideration of early sales.

## **6.2. Founder-CEOs**

In some cases, the founder-CEO (at the time of IPO) relinquishes their CEO role before the expiry of lock-ups. We expect that founders who continue to act as CEO and perform this role at the time of transactions (both purchase and sale) will be better informed than founders who relinquish their CEO role soon after IPOs. We therefore compare subsamples of founders who performed the CEO role at the time of the IPO, with the subsample of founders who perform the CEO role at the time of transactions (i.e. purchases and sales). In line with our expectations, the subsample with founders that relinquish their CEO role prior to transactions exhibit lower absolute CARs at the end of the +20 day window (+8.87% for purchases and -4.07% for sales).<sup>25</sup>

## **6.3. Founder- chairmen**

We also able compare the price impact and potential contrarian behaviour in subsamples of founder-CEO and founder-chairman (both subsamples are at the time of IPO). Unreported result, suggest that purchases (in both subsamples) tend to be driven by contrarian behaviour whilst sales do not. The price impact (both on the transaction announcement day and at the end of the +20 period) tends to be stronger in the subsample of founder-CEO sales (-0.55% compared to -0.31%; and -4.07% compared to -3.82%).<sup>26</sup> With purchases, the evidence of the price impact at the transaction date is less clear. Whilst founder-CEO purchases produce higher returns on the transaction date, founder-chairman purchases produce higher CARs at the end of +20 days period. Notably, founder-CEOs adopt contrarian strategy when purchasing whilst this does not appear to be the case with founder-chairmen purchases.

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<sup>25</sup> We document similar results regarding contrarian behaviour in both susbsamples. The unreported results are available upon request from authors

<sup>26</sup> The unreported results are available upon request from authors.

## 7. Conclusion

We examine director and VC firm dealings before and after lockup expiry in a sample of 201 UK IPOs during the period 1999-2014. The average (mean) length of lockups is 406 calendar days, with minimum and maximum values of 180 and 508 days, respectively. VC backed sample IPOs tend to have shorter lockups compared to their non-PE backed counterparts. The majority (74%) of the sample lockups are absolute lockups with a clear cut expiry date. We document more early (i.e. before lockup expiry) purchases and sales compared to the previous literature. The majority (75%) of VC firms sell their locked shares in instalments. In line with previous UK evidence, the results suggest negative and insignificant abnormal returns on both directors' and VC firms' lockup expiry dates.

Based on results for 908 director sales and 1,783 director purchases, directors follow a clear contrarian strategy, buying after significant (abnormal) price decreases and selling after significant (abnormal) price increases. The exceptions are directors' purchases before (scheduled) lockup expiry and (complete) VC firms' sales after lockup expiry. There are significant differences in information content of directors' transactions and dealings of VC firms before and after lockup expiry. For example, only directors' purchases (before and after scheduled lockup expiries) generate significant price impact. Overall, the price effect of director sales and purchases is stronger compared to the price effect of VC firm deals.

CEO purchases and sales produce significant price effects on the transaction dates. Over the entire period of the first 20 trading days, founders' purchases and CEOs' sales result in the highest (absolute) CARs. Purchases of directors appointed by VC firms produce surprisingly strong price impact, cumulating to statistically significant  $CAR_{0,20}$  of +13.43%. Overall evidence from this section suggests that investors value access to information via the founder-CEO role more highly compared to any other position within a company's hierarchy.

Our results contribute to both the IPO and the insider dealing literature. We also shed more light on changes in ownership after the lockup expiry. The increasing number of IPOs where underwriters allow lockup restrictions to prematurely lapse, raises important questions on whether UK lockups still live up to their name and provide sufficient encouragement to long-term performance improvements.

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**Table 1: Descriptive statistics**

This table presents sample descriptive statistics of IPO firms with lockups for directors (Panel A) and IPO firms with lockups for VC firms (Panel B). In Panel C we present number of directors' and VC firms' transactions. The sample in Panel B is a sub-sample of Panels A (i.e. all IPO firms with lockups for VC firms also have lockups for directors, but not all IPO firms with lockups for directors are VC backed). MCap is the mean (median) market capitalisation based on the first trading day closing price (in million £). MRaised is the mean (median) total amount raised at the IPO (in million £). Absolute lockup is the percentage of sample IPOs with absolute lockup (i.e. lockups with a fixed lockup date at the time of the IPO). Relative lockup is percentage of sample IPOs with relative lockups (i.e. lockup dates that depend on other disclosure events (like e.g. earnings announcements, or other company news), thus, lockup dates are not directly specified at the time of the IPO). Combined lockup is the percentage of sample IPOs with combined (i.e. absolute and relative) lockups. Lockup length is the mean (median) number of calendar days from the IPO date to the lockup expiry date. LUDays < ( $\geq$ , =, >) Median is a sub-sample of IPO firms with a number of lockup days below (equal and above, equal, above) the median number of lockup days in the total sample, Only abs LU is a sub-sample of IPO firms with only absolute lockups, and Only rel LU is a sub-sample of IPOs with only relative lockups.

**Panel A: IPO firms with lockups for directors**

	Total sample	LUDays < Median	LUDays $\geq$ Median	Only abs LU	Only rel LU	IPOs with only director LU
Number of IPO firms	201	49	152	148	38	103
MCap (£m), Mean (Median)	814.32 (267.94)	1113.42 (419.85)	717.90 (244.03)	1026.39 (271.93)	162.57 (104.73)	1061.52 (220.87)
MRaised (£m), Mean (Median)	219.05 (79.20)	223.06 (124.00)	217.67 (78.3)	212.08 (120.41)	60.49 (38.30)	242.77 (61.97)
Absolute lockup (%)	73.63%	63.27%	76.97%	100.00%	0.00%	70.87%
Relative lockup (%)	18.91%	26.53%	16.45%	0.00%	100.00%	21.36%
Combined lockup (%)	7.46%	10.20%	6.58%	0.00%	0.00%	7.77%
Lockup length in days, Mean (Median)	406.10 (365.00)	281.84 (301.00)	446.16 (365.00)	392.29 (365.00)	457.37 (402.00)	412.37 (365.00)

**Panel B: IPO firms with lockups for VC firms**

	Total sample	LUDays = Median	LUDays > Median	Only abs LU	Only rel LU	IPOs with only VC LU
Number of IPO firms	96	71	25	74	15	96
MCap (£m), Mean (Median)	522.62 (333.46)	622.09 (449.00)	240.14 (175.29)	603.81 (439.99)	217.65 (130.32)	522.62 (333.46)
MRaised (£m), Mean (Median)	195.77 (106.31)	227.71 (155.25)	105.07 (55.00)	227.90 (152.63)	84.09 (39.28)	195.77 (106.31)
Absolute lockup (%)	77.08%	88.73%	44.00%	100.00%	0.00%	77.08%
Relative lockup (%)	15.63%	7.04%	40.00%	0.00%	100.00%	15.63%
Combined lockup (%)	7.29%	4.23%	16.00%	0.00%	0.00%	7.29%
Lockup length in days, Mean (Median)	218.88 (180.00)	180.00 (180.00)	329.28 (365.00)	202.64 (180.00)	278.20 (270.00)	218.88 (180.00)

**Panel C: Number of directors' and VC firms transactions**

	<b>Purchases</b>	<b>Sales</b>
<b>Directors:</b>		
Prior to lockups' expiry	125	68
At and during the first year after lockups' expiry	278	162
From the first day after lockup expiry until the end of sample period	1,380	678
<b>Total number of directors' transactions</b>	<b>1,783</b>	<b>908</b>
<b>VC firms:</b>		
Prior to lockups' expiry	0	19
At and during the first year after lockups' expiry	0	95
From the first day after lockup expiry until the end of sample period	0	103
<b>Total number of VC firms' transactions</b>	<b>0</b>	<b>217</b>

**Table 2: Market reaction to expiry of lockups**

Panel A of this table presents results for CARs during a 2 trading day window around expiry of directors' and PE firms lockup. N is a number of IPO companies with positive and negative CARs, respectively. P-values reported for two parametric tests, (i) CS t-test: the cross sectional t-test (see Brown and Warner, 1980) and (ii) SCS t-test: the standardized cross sectional t-test (see Boehmer et al., 1991), and two non-parametric test, (i) the Corrado rank test (see Corrado, 1985) and (ii) Sign-test: the generalized sign test (see Cowan, 1992). In Panel B, we present CARs in subsamples with and without trades prior to lockup dates originally disclosed in IPO prospectuses.

Event window	-2 to +2 days	
	Directors	PE firms
CAR	-0.0087	-0.0106
N (positive/negative)	101/100	51/45
P-values:		
CS t-test	0.2791	0.3209
SCS t-test	0.3966	0.7222
Corrado rank	0.2401	0.8704
Sign-test	0.9288	0.7671

**Table 3: Director trades**

Event day is disclosure of director trades. We excluded transactions during the first calendar month after the IPO. Since the minimum lockup period is 180 calendar days, a trading transaction is only considered when it is at least 150 calendar days after the IPO. In Panel A, results are for directors' trades prior to lockup dates originally disclosed in IPO prospectuses. If a lockup's length is longer than 180 calendar days the considered period before lockup expiry increases correspondingly. N is the number of directors' purchase and sales transactions, respectively. In Panel B, results are for directors' trades during the first 252 trading days after the lockup dates originally disclosed in IPO prospectuses. N is the number of directors' purchase and sales transactions the first 252 trading days after lockup expiry, respectively. In Panel C, results are for all post IPO directors' trades. N is the number of all directors' purchase and sale transactions from the dates originally disclosed in IPO prospectuses until the end of the sample period. P-values reported for two parametric tests, (i) CS t-test: the cross sectional t-test (see Brown and Warner, 1980) and (ii) SCS t-test: the standardized cross sectional t-test (see Boehmer et al., 1991), and two non-parametric test, (i) the Corrado rank test (see Corrado, 1985) and (ii) Sign-test: the generalized sign test (see Cowan, 1992).

**Panel A: Prior to lockups' expiry**

Window	Purchases (N=125)				Sales (N=68)			
	-20 to -1	0	0 to +10	0 to +20	-20 to +1	0	0 to +10	0 to +20
CAR	-0.0349	0.0161	0.0454	0.0667	0.0368	0.0016	0.0013	-0.0158
N (postive/neg.)	52/73	73/52	85/40	83/42	40/28	30/38	29/39	28/40
CS t-test	0.0675	0.0103	0.002	0.0004	0.0219	0.6459	0.9484	0.5481
SCS t-test	0.0248	0.0084	0.0000	0.0000	0.0083	0.6802	0.9332	0.4117
Corrado rank	0.0570	0.0042	0.0020	0.0025	0.1753	0.9166	0.9177	0.175
Sign-test	0.0091	0.2476	0.0009	0.0032	0.0705	0.5359	0.3888	0.2694

**Panel B: On lockups' expiry and during the first year after lockups' expiry**

Window	Purchases (N=278)				Sales (N=162)			
	-20 to -1	0	0 to +10	0 to +20	-20 to +1	0	0 to +10	0 to +20
CAR	-0.0413	0.0100	0.0621	0.0839	0.0215	0.0043	-0.0075	0.0024
N (postive/neg.)	118/160	157/121	164/114	159/119	90/72	80/82	72/90	77/85
CS t-test	0.0175	0.0498	0.0000	0.0000	0.1001	0.0821	0.3186	0.8385
SCS t-test	0.0002	0.2161	0.0000	0.0000	0.0188	0.3816	0.1253	0.6990
Corrado rank	0.0336	0.1800	0.0023	0.0035	0.0144	0.5520	0.0441	0.7083
Sign-test	0.0044	0.0670	0.0076	0.0383	0.0287	0.5392	0.5186	0.8873

**Panel C: On lockups' expiry and until the end of the sample period**

Window	Purchases (N=1,783)				Sales (N=908)			
	-20 to -1	0	0 to +10	0 to +20	-20 to +1	0	0 to +10	0 to +20
CAR	-0.0453	0.0096	0.0407	0.0545	0.0218	-0.0003	-0.0156	-0.0256
N (postive/neg.)	740/1043	1001/782	1090/693	1071/712	534/374	406/502	362/546	370/538
CS-t-test	0.0000	0.0000	0.0000	0.0000	0.0000	0.7401	0.0000	0.0000
SCS t-test	0.0000	0.0000	0.0000	0.0000	0.0000	0.9003	0.0000	0.0000
Corrado rank	0.0000	0.0001	0.0000	0.0000	0.0000	0.3105	0.0000	0.0000
Sign-test	0.0000	0.0000	0.0000	0.0000	0.0000	0.4465	0.0002	0.0016

**Table 4: VC firms sales**

In Panel A, we present VC firms' sales. Sales during the first calendar month after the IPO are excluded. Since the minimum lockup period is 180 calendar days, a transaction is only considered when it is at least 150 calendar days after the IPO. If a lockup's length is longer than 180 calendar days the considered period before lockup expiry increases correspondingly. N is the number of VC firms' sales transactions. In Panel B, the sample consists of directors' trades during the first 252 trading days after the lockup date. The event day is disclosure of directors' trades. N is the number of VC firms' sales transactions during the first 252 trading days. In Panel C, results are for all VC firms' sales from the dates originally disclosed in IPO prospectuses until the end of the sample period. N is the number of all directors' purchase and sale transactions. P-values reported for two parametric tests, (i) CS t-test: the cross sectional t-test (see Brown and Warner, 1980) and (ii) SCS t-test: the standardized cross sectional t-test (see Boehmer et al., 1991), and two non-parametric test, (i) the Corrado rank test (see Corrado, 1985) and (ii) Sign-test: the generalized sign test (see Cowan, 1992).

**Panel A: Prior to lockups' expiry**

	<b>N=19</b>			
Window	<b>-20 to -1</b>	<b>0</b>	<b>0 to +10</b>	<b>0 to +20</b>
CAR	0.0829	0.0053	-0.0234	0.0018
N (postive/neg.)	11/08	09/10	08/11	12/07
CS t-test	0.0643	0.4746	0.4963	0.971
SCS t-test	0.0772	0.5298	0.8701	0.5803
Corrado rank	0.0428	0.6089	0.1584	0.9168
Sign-test	0.5406	0.7597	0.4444	0.2843

**Panel B: On lockups' expiry and during the first year after lockups' expiry**

	<b>N=95</b>			
Window	<b>-20 to -1</b>	<b>0</b>	<b>0 to +10</b>	<b>0 to +20</b>
CAR	0.0224	0.0000	0.0054	-0.0163
N (postive/neg.)	53/42	48/47	45/50	47/48
CS t-test	0.1495	0.9947	0.5845	0.3320
SCS t-test	0.0826	0.6683	0.4203	0.5240
Corrado rank	0.6502	0.8027	0.3855	0.7648
Sign-test	0.1153	0.5839	0.9454	0.7321

**Panel C: On lockups' expiry and until the end of the sample period**

	<b>N=217</b>			
Window	<b>-20 to -1</b>	<b>0</b>	<b>0 to +10</b>	<b>0 to +20</b>
CAR	0.0350	0.0025	0.0004	-0.0123
N (positive/negative)	126/91	114/103	103/114	107/110
CS t-test	0.0035	0.3536	0.9600	0.2933
SCS t-test	0.0005	0.1781	0.3847	0.9492
Corrado Rank	0.0329	0.1874	0.7806	0.9809
Sign-test	0.0013	0.1116	0.9242	0.5227

**Table 5: Comparison of VC firm first and subsequent sales**

N is number of VC firms' sales. P-values reported for two parametric tests, (i) CS t-test: the cross sectional t-test (see Brown and Warner, 1980) and (ii) SCS t-test: the standardized cross sectional t-test (see Boehmer et al., 1991), and two non-parametric test, (i) the Corrado rank test (see Corrado, 1985) and (ii) Sign-test: the generalized sign test (see Cowan, 1992).

**Panel A: VC firm first sales**

	VC firm first sales							
	Complete (N=14)				Partial (N=43)			
	-20 to -1	0	0 to +10	0 to +20	-20 to -1	0	0 to +10	0 to +20
Window								
CAR	0.0915	0.0064	-0.001	-0.0263	0.0139	-0.0007	-0.0296	-0.0478
N (positive/neg.)	09/05	08/06	07/07	08/06	21/22	18/25	18/25	17/26
CS t-test	0.1298	0.4289	0.9608	0.7438	0.5664	0.906	0.1884	0.0825
SCS t-test	0.0436	0.7651	0.7648	0.6875	0.3346	0.7552	0.2762	0.1923
Corrado rank	0.0542	0.6064	0.2256	0.9432	0.1967	0.984	0.3484	0.2667
Sign-test	0.3402	0.6753	0.9078	0.6753	0.5738	0.7204	0.7204	0.5062

**Panel B: VC firm subsequent sales**

	PE subsequent sales							
	Complete (N=39)				Partial (N=124)			
	-20 to -1	0	0 to +10	0 to +20	-20 to -1	0	0 to +10	0 to +20
Window								
CAR	0.0124	-0.0052	-0.0184	-0.0331	0.0409	0.0054	0.0167	0.0083
N (positive/neg.)	21/18	20/19	16/23	16/23	75/49	70/54	63/61	68/56
CS t-test	0.4159	0.4354	0.0734	0.0584	0.0192	0.1359	0.0671	0.5701
SCS t-test	0.4227	0.5084	0.3356	0.1189	0.0056	0.0543	0.0189	0.1349
Corrado rank	0.2335	0.8977	0.5895	0.5648	0.4400	0.1119	0.0935	0.2983
Sign-test	0.3546	0.5454	0.4968	0.4968	0.0042	0.0497	0.4813	0.1089

**Table 6: Dealings by different types of insiders**

Panel A exhibits CARs associated with transactions of all company's CEOs. Panel B shows CARs for all company founders' purchases and sales. Panel C documents CARs associated with transactions of company directors appointed by VC firms (i.e. VC directors). Panel D documents CARs associated with transactions of company founder-CEOs. P-values are reported for two parametric tests, (i) CS t-test: the cross sectional t-test (see Brown and Warner, 1980) and (ii) SCS t-test: the standardized cross sectional t-test (see Boehmer et al., 1991), and two non-parametric test, (i) the Corrado rank test (see Corrado, 1985) and (ii) Sign-test: the generalized sign test (see Cowan, 1992). N is the number of transactions.

**Panel A: CEOs' transactions**

Window	CEO purchases (N = 195)				CEO sales (N = 99)			
	(-20...-1)	(0...0)	(0...10)	(0...20)	(-20...-1)	(0...0)	(0...10)	(0...20)
CAR	-0.0563	0.0133	0.0581	0.0832	0.0109	-0.0071	-0.0288	-0.0456
N (positive/negative)	70/125	102/93	128/67	126/69	52/47	35/64	30/69	29/70
CS t-test	0.0001	0.0478	0.0000	0.0000	0.2237	0.0014	0.0000	0.0000
SCS t-test	0.0000	0.0463	0.0000	0.0000	0.1173	0.0040	0.0000	0.0000
Corrado Rank	0.0015	0.0914	0.0004	0.0000	0.0738	0.0076	0.0005	0.0016
Sign-test	0.0000	0.7454	0.0001	0.0002	0.1297	0.0549	0.0034	0.0017

**Panel B: Founders' transactions**

Window	Founder purchases (N = 153)				Founder sales (N = 132)			
	(-20...-1)	(0...0)	(0...10)	(0...20)	(-20...-1)	(0...0)	(0...10)	(0...20)
CAR	-0.0687	0.0111	0.0648	0.0943	0.0069	-0.0016	-0.0249	-0.0329
N (positive/negative)	60/93	85/68	102/51	105/48	71/61	58/74	55/77	52/80
CS t-test	0.0002	0.1491	0.0000	0.0000	0.5090	0.5512	0.0008	0.0008
SCS t-test	0.0000	0.3352	0.0000	0.0000	0.0564	0.7947	0.0081	0.0061
Corrado Rank	0.0061	0.1756	0.0002	0.0000	0.1123	0.6965	0.0159	0.0666
Sign-test	0.0023	0.3224	0.0002	0.0000	0.0193	0.9534	0.6398	0.3200

**Table 6: continues...**

**Panel C: VC directors' transactions**

	VC director purchases (N = 15)				VC director sales (N = 18)			
Window	(-20...-1)	(0...0)	(0...10)	(0...20)	(-20...-1)	(0...0)	(0...10)	(0...20)
CAR	-0.0047	0.0089	0.07320	0.1343	0.0021	0.0006	-0.0030	-0.0165
N (positive/negative)	04/11	09/06	09/06	11/04	10/08	09/09	08/10	07/11
CS t-test	0.9671	0.3439	0.0495	0.0063	0.9704	0.9545	0.9068	0.6693
SCS t-test	0.1129	0.1267	0.0646	0.0353	0.1778	0.6130	0.9577	0.5226
Corrado Rank	0.0018	0.3959	0.2526	0.0099	0.1480	0.4356	0.4460	0.6262
Sign-test	0.1089	0.3258	0.3258	0.0437	0.4261	0.7467	0.8810	0.5336

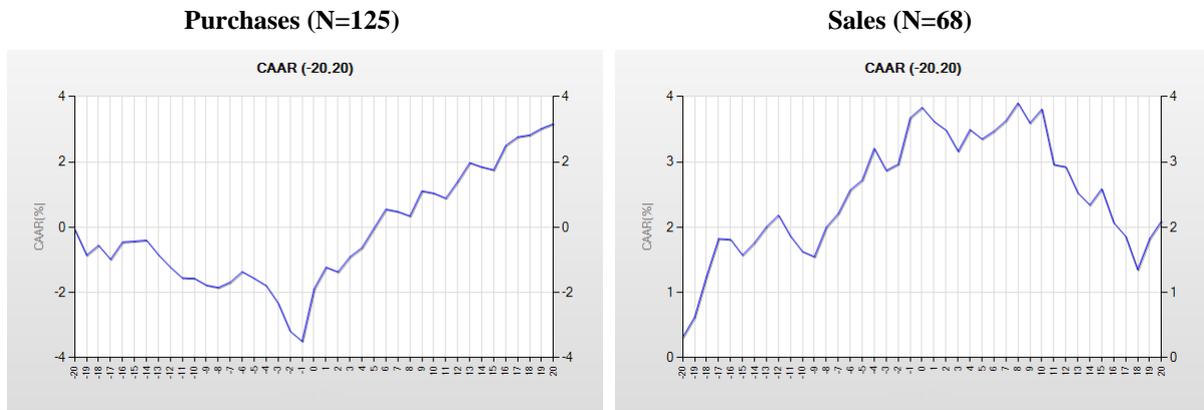
**Panel D: Founder-CEOs' transactions**

	Founder CEO purchases (N = 52)				Founder CEO sales (N = 39)			
Window	(-20...-1)	(0...0)	(0...10)	(0...20)	(-20...-1)	(0...0)	(0...10)	(0...20)
CAR	-0.0977	0.0211	0.0882	0.1255	0.0049	-0.0053	-0.0391	-0.0532
N (positive/negative)	18/34	29/23	37/15	38/14	20/19	15/24	10/29	10/29
CS t-test	0.0046	0.3029	0.0044	0.0006	0.7552	0.1688	0.0008	0.0004
SCS t-test	0.0061	0.4948	0.0019	0.0001	0.4768	0.1415	0.0064	0.0012
Corrado Rank	0.1519	0.3555	0.0052	0.0001	0.2720	0.1805	0.0062	0.0287
Sign-test	0.0052	0.7880	0.0126	0.0056	0.2169	0.6966	0.0439	0.0439

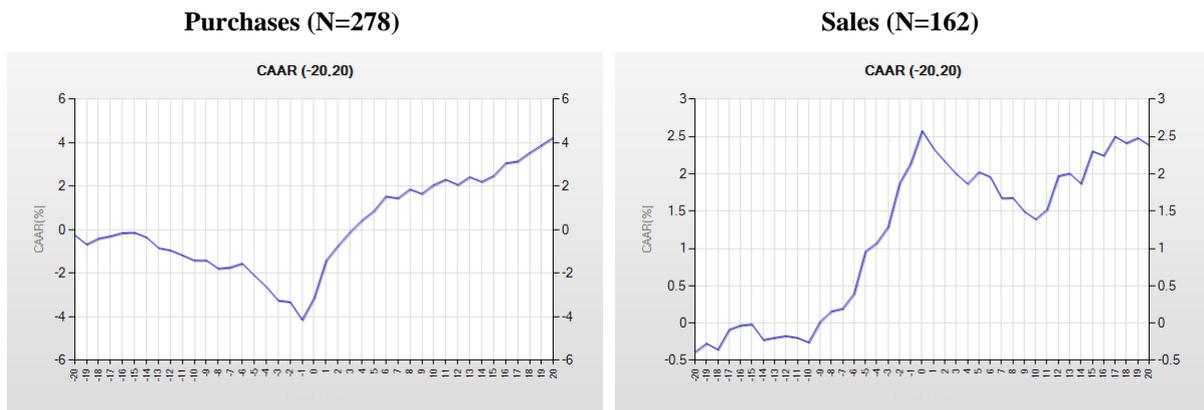
**Figure 1: Director trades**

Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date).

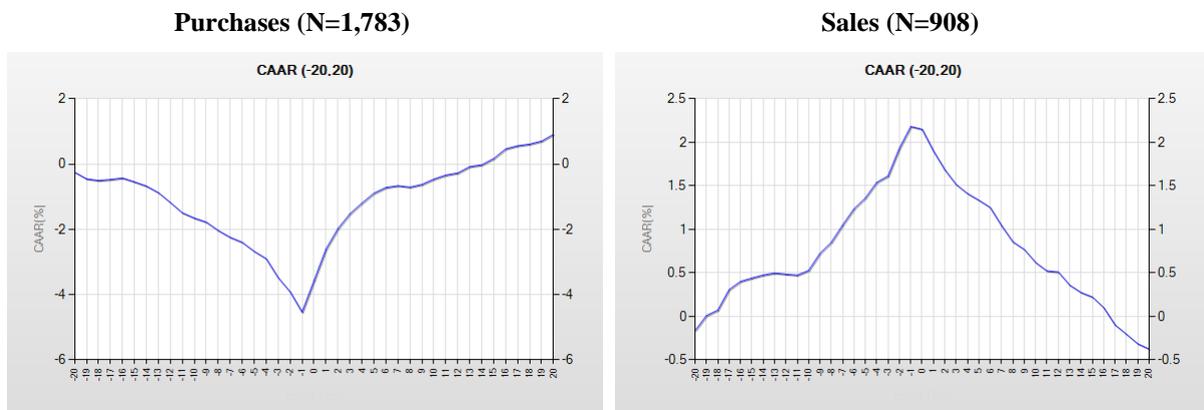
**Panel A: Prior to lockups' expiry**



**Panel B: On expiry dates and during the first year after lockups' expiry**



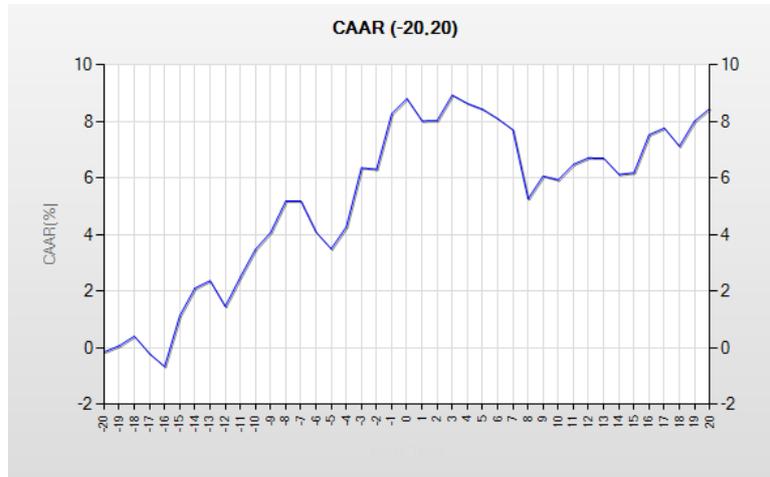
**Panel C: On expiry dates and until end of sample period**



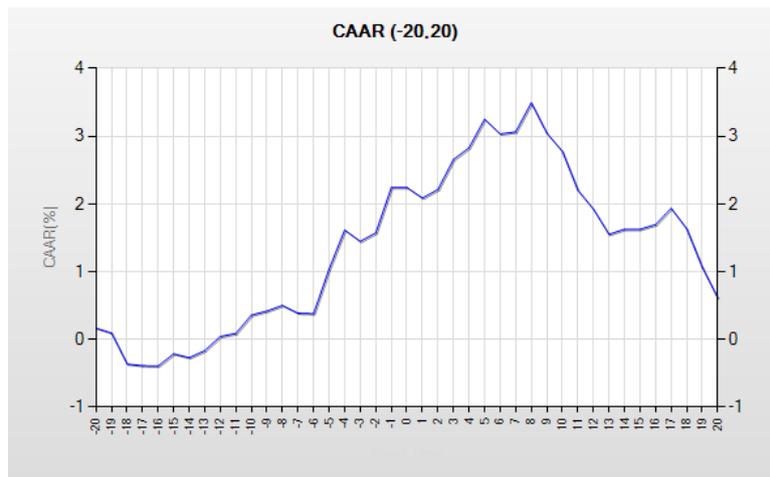
**Figure 2: VC firm sales**

Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date).

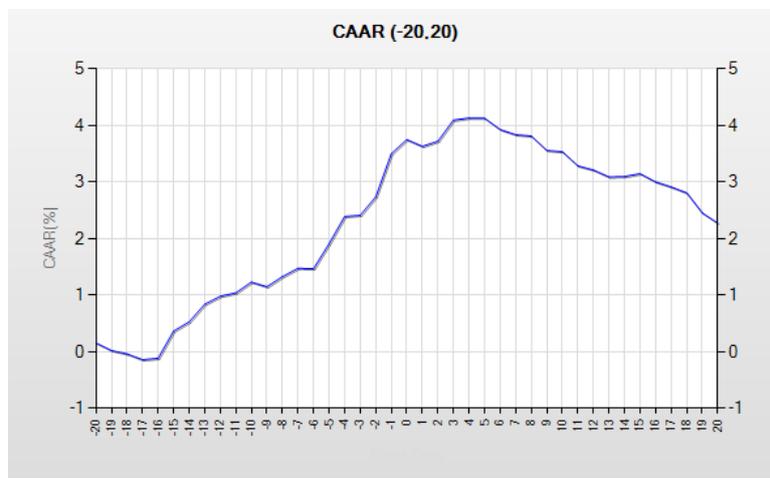
**Panel A: Prior to lockups' expiry (N = 19)**



**Panel B: On expiry dates and during the first year after lockups' expiry (N = 95)**



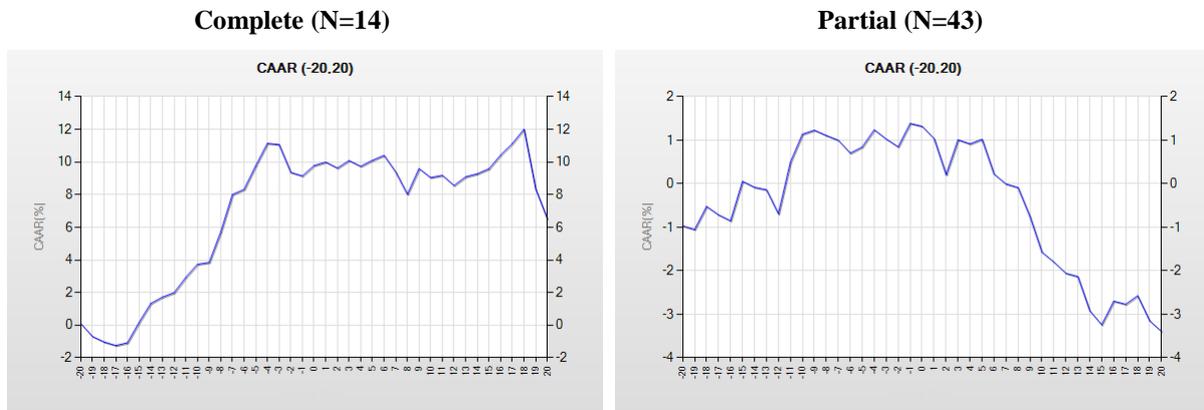
**Panel C: On expiry dates and until end of sample period (N = 217)**



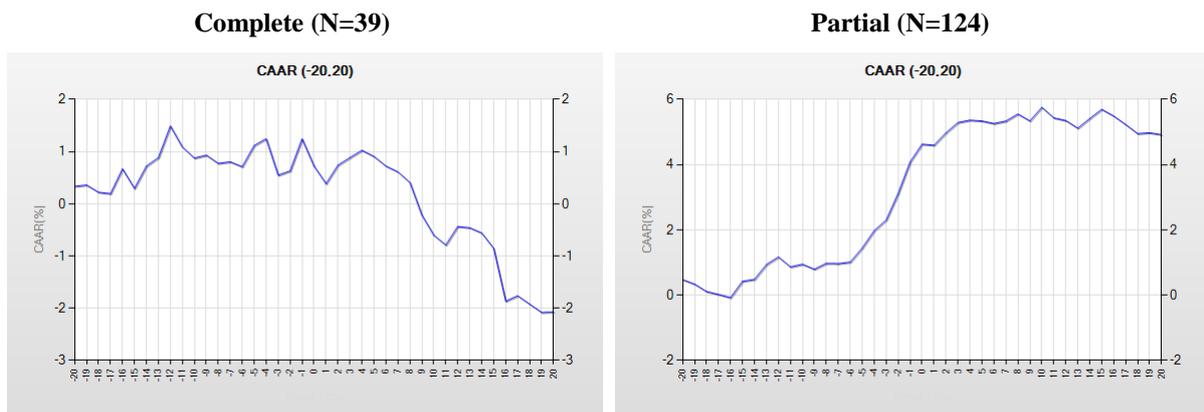
**Figure 3: VC firms' first and subsequent sales**

Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date).

**Panel A: VC firm first sales**



**Panel B: VC firm subsequent sales**

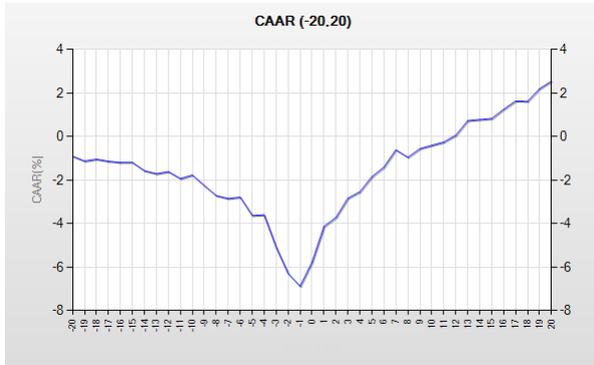


**Figure 4: Dealings by different types of directors**

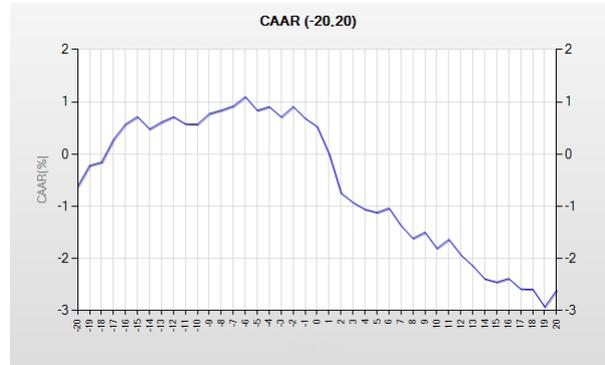
Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date). Panel A shows CARs for company founders. Panel B exhibits CARs of directors that are CEO at the time of their transaction. Panel C documents CARs for those founders that are also CEO at the time of their transaction

**Panel A: Founders' dealings**

**Purchases (N=153)**

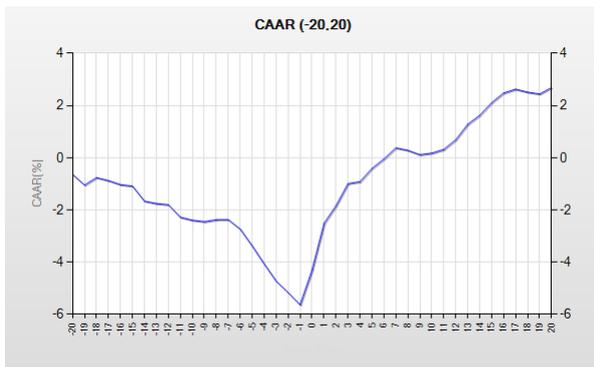


**Sales (N=132)**

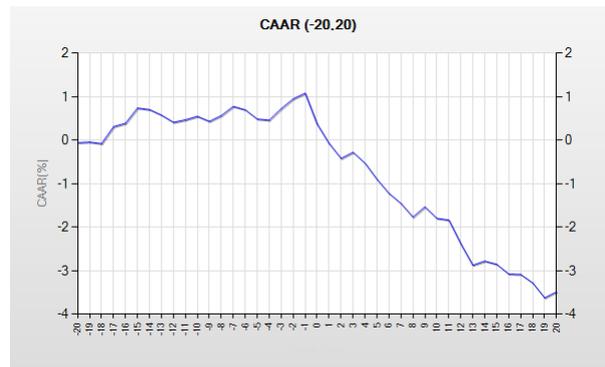


**Panel B: CEO dealings**

**Purchases (N=195)**

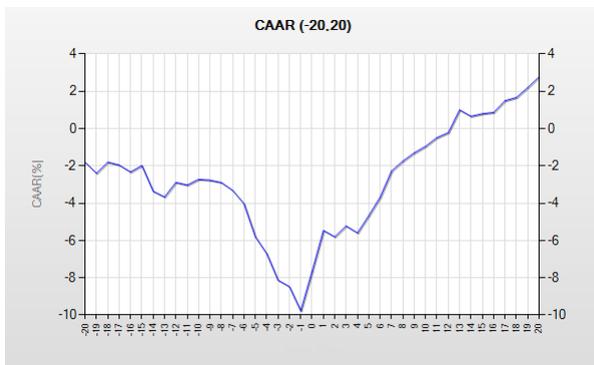


**Sales (N=99)**



**Panel C: Founder- CEOs' dealings**

**Purchases (N=52)**



**Sales (N=39)**

