Do all bosses fill their boots?
Evidence from insider trading around IPO lockups

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Abstract

We examine insiders' (executives, non-executive directors, and PE firms) trades completed before (scheduled) lockup expiry, and during a 2-year period after expiry of IPO lockups. Disclosure of directors' purchases generates a significant positive short term price impact. The significant negative price impact is documented only for disclosure of sales completed before the scheduled lockup expires (i.e. early sales). Overall, directors exhibit contrarian behaviour in case of purchases but not sales. Executives profit from both purchases and sales, and their trades are more informative compared to non-executive directors. The executives' buy-and-hold market adjusted (i.e. "mimicking") returns are particularly high from purchases during the periods of market crises (dot.com bubble and recent financial crisis). CFOs profit more than CEOs only for purchases but the difference disappears shortly after the disclosure day. Independent directors do not profit from sales but do profit from purchases. They profit significantly less compared to executives, when they sell. Independent directors' trades (purchases and sales) however do not perform differently from trades of other non-executive directors (e.g. Chairs, Former, and PDMRs). PE firms tend to sell in instalments and their sales do not generate a significant short term price impact. Sales of more reputable PE firms generate higher buy-and-hold returns.

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. The lockups are determined by underwriters and expiry dates are disclosed in IPO prospectuses. 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). Expiry of IPO lockups mark potentially large scale entry of informed insider traders who are the first time allowed to sell without (advance) disclosure. The lockups' expiries are therefore abrupt, preannounced events which do not systematically coincide with other corporate events (e.g. dividend changes, mergers and acquisitions, etc.).

Previous literature, examined price effect of IPO lockup expiries (without consideration of insider dealings) or insider dealings in IPO firms (without consideration of the lockup expiries). [1] Exceptions are Hoque and Lasfer (2009) and Espenlaub et al. (2014). For example, Espenlaub et al. (2014) examine short term price effect of directors' dealings in UK IPOs during a period during 1992-1998. Authors report that share and stock market run ups and size of firms tend to increase the likelihood of directors' sales around (i.e. 10 weeks before and after) the lockup expiry. Hoque and Lasfer (2009) analyse a sample of IPOs from, predominantly the London Stock Exchange's (LSE) Second board, during 1999-2007.[2] Similarly to Espenlaub et al. (2014), they report cases where underwriters allow for early release from the lockups. For example, they report that 14% of all directors' sales occurred before the originally agreed lockup expiry dates.[3] The directors' early sales generate significant negative abnormal returns.

In this study, we analyze executives', non-executive directors', and PE firms' trades completed before and during a 2-year period after expiry of UK IPO lockups. First, we perform an event type study focusing on the price impact and timing abilities of different types of the

[1] An extensive body of literature examines the price effect of insider dealings around various corporate events such as: secondary share issues (Billett et al., 2011), share repurchases (Dittmar and Field 2015), corporate debt issues (Kahle, 2000), dividend changes (Farre-Mensa et al 2014), and mergers and acquisitions (Netter et al., 2011**).**

[2] It is worth noting that regulation in the Main and Second (i.e. Alternative Investment Market – AIM) differs. For example, the lockups are voluntary in the Main but mandatory in the Second board.

[3] Field and Hanka (2001) and Brav and Gompers (2003) report early sales in 17% and 15% of their US sample IPOs, respectively.

insiders. Second, we examine informativeness of trades by comparing the individual trading performance for various horizons (up to 360 days after disclosure of the trades). We hypothesise that the information content of trades depends on the type of directors (i.e. *CEOs, CFOs,* chairs, independent directors, former directors, and persons dispensing managerial responsibilities *(PDMRs)).* For example, company executives and/or board members are expected to trade on more valuable information compared to other insiders and their trades should, therefore, be associated with a better trading performance.

We contribute to the literature by examining both the short term price effect and trading performance of insiders' dealings. We also test the hierarchy hypothesis by comparing the performance of seven different types of insiders during a very long post IPO period, before and after lockup expiries. 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.

Our results show a significant short term price impact of directors' purchases and sales for the transactions completed up to two years after lockup expiry. Directors exhibit contrarian behaviour in case of purchases but not sales. Executives profit from both purchases and sales and their trades are most informative. The economic significance is therefore much higher for executives' purchases than sales. For example, their average pound profit is £583,634 for sales and £1,675,815 for purchases. The executives' profits are particularly high from purchases during the crises periods. *CFOs* profit more than *CEO*s only for purchases but the difference disappears shortly after the disclosure day. Independent directors do not profit from sales but do profit from purchases. They profit significantly less compared to executives when they sell. Independent directors' trades do not perform differently from other non-executive directors.

Overall, evidence suggests that PE firms tend to sell in instalments and do not rush to sell. We document lack of price impact and contrarian behaviour for PE firms' sales. There is however notable difference between first and subsequent partial PE firms' sales. For example, only the first partial sales produce a statistically significant negative impact. In terms of buy-and-hold returns, PE firms' sales completed during market crisis, and before scheduled lockup expiry perform particularly badly. More reputable PE firms tend to generate higher buy-and-hold returns.

The remainder of this paper proceeds as follows. Section 2 presents key features of UK regulation on IPO lockups and insider dealing. Section 3 summarises the literature and motivates the hypotheses. Section 4 presents the data and sample characteristics. Section 5 presents the methodology. Section 6 presents the estimated results. We conduct several robustness checks in Section 7. Section 8 concludes the paper.

2. UK regulation on insider dealings and IPO lockups

For companies listed on the main board of the LSE, lockups are completely voluntary.[4] Further to restrictions stipulated in lockup agreements and published in IPO prospectuses, insider trades are also restricted by insider trading regulations. 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 consequently sales by directors and PE firms before the originally agreed lockup expiry date. The Financial Conduct Authority (FCA) considers possible modifications of a particular lock-up agreement, during the lock-up period, as relevant information for disclosure purposes. In other words firms are expected to disclose these terms or conditions regarding lock-up agreements at the time when lockups are announced and/or published. Similarly, explicit disclosure requirements exist in relation to IPO prospectuses. The IPO prospectus rules specifically require disclosure of the period of the lock up and content and exceptions of the lockup agreement.

The regulation on insider trading has existed in the UK since 1976. The regulation is stipulated in the 1977 Model Code of the LSE and the 1985 Companies Act. As a member of the European Community (EC), the UK also 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.[5] FCA is the UK regulatory and supervisory authority covering the implementation of MAD.

[4] In the LSE's second board (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 years (AIM Rule 7). IPOs in the AIM are frequently including warrants in their underwriter compensation packages (see Khurshed et al., 2016).

[5] 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).

Importantly, directors of companies traded on the LSE's Main board are not allowed to trade during the two months prior to a preliminary, annual or interim earnings announcement and one month prior to quarterly earnings announcements.[6] Mandatory reporting by insiders in UK publicly listed firms is limited to the executives and non-executive board members. They are required to disclose their trades within 5 trading days.[7] The company must also notify the LSE of the transaction and an entry should be made in the Company register within 3 working days from transaction date.

3. Literature and hypotheses

3.1. Price impact of insiders' deals and IPO lockups

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, PE 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, PE 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.[8] For example, we expect that PEs' continued involvement in the company may be considered as good news by investors. Alternatively, partial sales may signal that PE firms are not ready to exit thus implying some "unfinished" work (e.g. further restructuring). The alternative hypothesis is particularly relevant for the PE firms' first partial sales.

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 direc-

[6] There are no similar trading bans in the US system which adopts an alternative approach favouring frequent disclosure. Some companies however introduce voluntary in-house restrictions on trading prior to the earnings announcements (see Syvakumar and Waymire, 1994).

[7] Independent directors are boards' members who only dictate a part of their available time to the company in an advisory capacity.

[8] 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.

tors' 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 (e.g. PE). However, if directors purchase at the same time as PE firms sell, then the market may still be concerned. If directors' purchase just after the PE firm sells then two scenarios are possible: (i) investors may be worried about entrenchment after the PE firm exits and the overall effect may be weaker; (ii) the market may see directors' 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. The strength of the signal in different scenarios will be determined empirically.

According to information asymmetry literature (e.g. Mayers and Majluf, 1984) managers are more likely to take a company public when it is overvalued. Furthermore, the overvaluation would provide incentives to directors to sell following the IPOs. The overvaluation is more likely a motive for sales in cases of complete as opposed to partial sales and in case of early as opposed to sales long time after lockup expiry.[9] We therefore hypothesise that the early sales (i.e. sales before originally agreed lockup dates) can provide valuable information to investors.

PE investors are committed long term investors who add value via their expertise and changes in corporate governance (Cumming et al., 2007; Megginson and Weiss, 1991). 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 PE exit could be seen 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.

[9] Kahle (2000) examined insider trading and the long-run performance of new security issues and separated firms where overvaluation was a motive for insiders' sales from other firms. The author shows that insider sales increase and purchases decrease prior to issues of information-sensitive securities such as convertible debt and equity by industrial firms. By examining the relation between insider trading and subsequent stock returns the author shows that seasoned equity issues where managers sell prior to the issue are more likely to be motivated by stock market overvaluation.

3.2. Hierarchy hypothesis

Prior studies on US insider dealings highlight differences in the information content of different types of insiders (see Seyhun, 1986; Ravina and Sapienza, 2010).[10] For example, Seyhen (1986) finds 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 sales of 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 conjecture that executives trade on more credible information and therefore expect a significant price reaction associated with their purchases and sales.

When it comes to difference between informativeness of *CEO* and *CFO* trades, previous literature provides two alternative hypotheses. On the one hand, *CFOs* are in charge of the firms' financial policies and financial reporting processes and are privy to specific perhaps to greater extent than *CEOs* (see Wang et al., 2012). However, they are still subordinated to *CEOs* and obliged to inform them of any relevant private information. *CEOs* therefore should have information advantage over *CFOs* (see Graham and Harvey, 2001). The differences in informativeness of *CEOs'* and *CFOs'* trades will be determined empirically.

4. Data and sample characteristics

4.1. IPO lockups

The information on the IPO date, issue price, market capitalisation, industry and money raised is collected from the LSE website. We obtain IPO prospectuses from the Perfect Information Navigator database and hand collect information on lockup agreements (expiry

[10] 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).

type[11], expiry date), directors' names and roles, insiders ownership, PE firm(s), underwriters, primary and secondary shares offered and the percentage of shares locked up.[12]

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

In total, there were 851 IPOs on LSE Main market during 1999-2014 (Table 1 - Panel A).[13] We excluded 168 IPOs incorporated outside UK, and 466 IPOs from insurance (11), real estate (20), investment companies and entities (235), equity and non-equity investment instruments (151) and banking and finance (49). The above procedure results in 217 non-financial UK IPOs during the sample period. Directors in 24 IPOs however did not make any dealings during the sample period. We also excluded IPOs without lockups (7), IPOs without dealings during the 2-year period post lockup expiry (13), and IPOs with missing stock market prices (1). The above filters resulted in the sample of 172 IPOs with lockups and with insider dealings before lockups' expiry and during the 2-year post lockup period.

Unreported results suggest the mean (median) size (i.e. Market capitalisation at time of IPO) of sample IPOs around £884 (£319) million. On average, sample IPOs raised around £244 million. The average sample IPO is 20 years old (minimum is 1 year and maximum is 111 years). The most represented industries in the sample are Services and Manufacturing with 39% and 22%, respectively. On average, 47% of directors' shares in the sample IPOs are locked. The mean (median) length of lockups for directors is 406 (365) days, with a minimum and maximum lockup length of 174 and 1,095 days, respectively. Lockups for PE firms tend to be shorter compared to lockups for directors, with a mean (median) length of 224 (180) days.

4.2. Directors' dealings data and descriptive statistics

We obtained the deals notifications from the Perfect Information Navigator and manually extract data on transactions and corresponding dates for PE-backed firms. We collected data on PE transactions by tracking all disclosures by the company after the IPO in Perfect Filings database. We than matched all PEs in IPO prospectus with the post-IPO share sales and rec-

[11] We use Perfect Information Navigator database to find event dates in case of relative expiry lockups which are usually linked with announcements like preliminary results, publication of accounts etc.
[12] We consider only transactions of PE firms with more than 3% shareholdings in sample companies.
[13] Data on LSE new issue statistics is from: http://www.londonstockexchange.com /statistics/new-issues-further-issues/new-issues-further-issues.htm.

orded whenever a PE had a transaction in shares. Data on IPO firms is matched with data on insiders' transactions from the data on directors' deals (DD) from Smart Insider database.[14] Daily stock prices for all sample IPOs are obtained from Thomson Reuters Datastream.

The Smart Insider database covers trades of executive directors, former directors, persons dispensing managerial responsibilities *(PDMRs)*, independent directors (members of boards and/or in an advisory capacity on a part time basis), and boards' chairs. We trace directors' deals from IPO date up to two years following expiry of the lockups. We exclude trades on preferred shares, transfers, option exercises, and dividend related transactions. We also checked for any insiders' transactions during ban (i.e. quiet) periods prior to annual, interim, quarterly and preliminary earnings announcements. The above filters resulted in 1,531 directors' deals in ordinary shares.

In line with evidence in other European countries, the overall number of purchases (951) is higher than the number of sales (570).[15] In line with other studies, directors' sales tend to be larger transactions than purchases. [16] For example, median transaction size is £631,420 for sales compared to £24,000 for purchases. Trades of non-executive directors, on average, non-executive trades tend to be larger than executive trades. For example, the mean value for executives' sales is £3,670,884 compared to the mean of £16,727,298 for independent directors.[17]

Former directors constitute the largest group among directors. Their transactions constitute 44% of all purchases and 45% of all directors' sales. Trades of independent directors are the second largest group among purchases (31%) but the smallest group among sales (6%). Executive directors' *(CEOs and CFOs)* constitute 16% of purchases and 15% of sales. The lowest frequency of trades (both sales and purchases) by the executives could be related to the highest scrutiny of their transactions which may result in their more cautious approach and hesitance to trade more frequently (see Jeng et al., 2003). Finally, *PDMRs* are the second largest group among sales (34%). Although not board members they are employees consid-

[14] See https://www.smartinsider.com.
[15] See evidence reported on (non-lockup related) director trades in the UK (Fidrmuc et al., 2006; Hoque and Lasfer, 2015), the US (Lakonishok and Lee, 2001), and European (Aussenegg et al., 2018) markets.
[16] This compares to a median transaction size of €128,071 for sales and of €39,053 for purchases of a European (non-UK) sample of 16,658 sales and 29,514 purchases transaction, respectively, used in Aussenegg et al. (2018).
[17] The difference in the mean values is statistically significant at 5% level.

ered to be a party to price sensitive information and therefore they (and their connected persons) are subjected to the same rules as board members.[18] Their transactions represent only 8% of all directors' purchases.

Figure 1 shows the number of all insiders (directors and PE firms) monthly purchases and sale transactions in each month during the entire sample period. The figure clearly depicts that the number of directors' purchases peaked during dot-com bubble (2002) and during the recent financial crisis (2008). Interestingly, the number of directors' sales peaked prior to the recent financial crisis (2006-07).

***** Insert Figure 1 about here *****

Table 2 presents the timing of all insider transactions relative to IPO lockup expiry date. We identify the following distinct periods: i) from IPO date to a (scheduled) lockup expiry as reported in IPO prospectus; ii) from a lockup expiry date up to the end of the first year after the expiry; iii) from the end of the first year after the expiry up to the end of the second year after the lockup expiry (see Figure 2).

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

***** Insert Figure 2 about here *****

Directors' made 134 sales and 270 purchases during the first period, prior to lockup expiry. This represents about 23.5% of all sales and about 28.4% of all directors' purchases. Majority of directors' sales and purchases occurred during the first year after lockup expiry (about 45.6% and 42.2% respectively). Finally, directors' sales and purchases, in the second year, represent 30.9% and 29.4% of all corresponding directors' transactions, respectively. In case of PE firms, 23.0% of all sales occurred prior to lockups' expiry. This is followed by 53.1% of sales during the first, and 23.9% during the second year after lockups' expiry.

The number of IPOs where directors were able to change the original terms of the lockups is surprisingly high. For example, directors of 25.0% of sample IPOs were able to sell before originally agreed date of lockup, as disclosed in IPO prospectus. The above percentage is

[18] See UK Financial Conduct Authority (FCA) reporting requirements (DTR 3.1.2 through to DTR 3.1.8).

higher than 14% reported in Hoque and Lasfer (2009) and Espenlaub et al. (2014) respectively.[19] 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 2007-2009 crisis.[20] With purchases, directors in 50.0% of sample IPOs purchased shares during the period before originally agreed lockup expiry. This percentage is again higher than the 31% reported in Hoque and Lasfer (2009).

Figures 3 and 4 show quarterly distributions of directors' purchases and sales before and after lockup expiry. Both purchases and sales peaked in the first quarter after lockup expiry.

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

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

4.3. PE firms' dealings data and descriptive statistics

We manually checked all the filings of each PE backed IPO to extract the share sale announcements, together with transaction dates and ownership changes, by all PE firms.[21] This resulted with data for 226 sales (and zero purchases) of PE firms during the sample period. From the IPO companies notifications to Company register we were also able to verify if sales were partial or complete and if the transactions occurred before, at, or after lockup expiry dates. Notably, PE firms tend to sell in instalments. For example, only 11% of sales are first and complete sales. Majority of sales are therefore either first partial (30%) or subsequent partial (49%) sales. PE firms also take their time and do not rush with their sales. For example, average (mean) cumulative holding immediately after IPO is 29.6%. At lockup expiry the percentage is 25.3%. One year after the lockup expiry the percentage drops to 14.0%. Finally, the percentage is 9.0% two years after lockup expires.

Figure 5 shows quarterly distribution of PE firms' sales before and after lockup expiry. The number of sales peaked in the first quarter. Notably, there were more sales in some quarters

[19] It is also worth mentioning that Hoque and Lasfer (2009) sample ends in 2007 whilst Espenlaub et al. (2014) examine UK IPOs during the 1990s.

[20] US underwriters have allowed insiders in 11.4% of all IPOs to sell shares before lockup expirations since 2008 (The Wall Street Journal, 2012).

[21] To the best of our knowledge there is no specific regulation regarding disclosure of PE trades other than a requirement that all institutional investors have to report if they sell 3% or more of the outstanding shares.

before lockup expiry compared to post lockup expiry quarters (especially during the second year after lockup expiry). The percentage for PE firms able to sell before originally contracted lockup dates is 3.4%.

***** Insert Figure 5 about here *****

5. Methodology

Using a standard event-study methodology we examine the price effect (i.e. abnormal returns) during the period of 20 trading days before and after insider dealings.[22] Importantly, the event date is disclosure (i.e. reporting) date of insiders' transactions. An estimation window of 200 trading days before the event window is used to estimate market model parameters. We are using total returns from Datastream (i.e. total return indices) and returns of the FTSE All Shares market index.[23] To examine the significance of cumulative abnormal returns (CARs), we perform the standardized cross sectional t-test (SCS-test) by Boehmer et al. (1991) and the non-parametric Corrado and Zivney (1992) Rank-test.[24] Marks and Musemeci (2017) show that the test by Boehmer et. al. is well specified when the event itself creates additional return variance and therefore is preferred to other possible choices (e.g. cross sectional (CS) t-test).[25] Our reported test statistics show statistical significance at the 1% level only if both test statistics are at or below a p-value of 0.01. Similarly, statistical significant at the 5% level was reported only if both test statistics are at or below a p-value of 0.05.[26]

To further compare the performance and informativenes of trades, we run the following regression for all directors' trades:

$$BHAR_{t,i} = \alpha_i + \beta_1 \cdot Independent_i + \beta_2 \cdot Chair_i + \beta_3 \cdot PDMR_i + \beta_4 \cdot Former_i + \beta_5 \cdot Female_i + \beta_6 \cdot T\_size_i + \beta_7 \cdot D\_holdings_i + \beta_8 \cdot O\_sell\_bef_i + \beta_9 \cdot O\_buy\_bef_i + \beta_{10} \cdot PE\_sell\_bef_i + \beta_{11} \cdot L\_exp\_bef_i + \beta_{12} \cdot Crises_i + \beta_{13} \cdot MCap_i + \beta_{14} \cdot Services_i + \beta_{15} \cdot MB_i + \beta_{16} \cdot Dual\_roles_i + \varepsilon_i \quad \textit{(Eq. 1)}$$

[22] The use of daily stock returns reduces the joint-hypothesis problem, enhances the power of statistical tests (see Friedrich et al., 2002) and is in line with previous studies (e.g. Fidrmuc et al., 2013).
[23] Datastream's return index (RI) includes the re-investment of dividends and accounts for all artificial price changes (e.g. stock splits, subscription rights, etc.).
[24] The SCS-Test is robust to event-induced volatility and the Rank-test in addition accounts implicitly for cross-sectional correlation (see e.g. Kolari and Pynnönen, 2010).
[25] For more on CS test see Brown and Warner (1980).
[26] This approach is conservative and makes sure that over-rejecting the null hypothesis of zero abnormal returns (e.g. due to event-date clustering) is reduced.

We use the same regression model for purchases and sales. The dependent variable is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of (all) directors purchases and sales, respectively.[27] The returns are "mimicking" returns that it would have been achieved from investing £1 by either purchasing £1 worth of the company stock when an insider buys, or by selling £1 worth of the company stock when and insider sells. The level of *BHAR* (i.e. constant term, α_i, in equation 1) is an implicit measure of how much information executive and non-executive directors have vis-à-vis market. The coefficients β_1, β_2, β_3, and β_4 measure the quantity of private information acquired by executives vis-à-vis different groups of non-executive directors. In line with our hierarchy hypothesis, we make an implicit assumption here that executives the maximum level of insider information due to their roles in the firm.

Independent directors are boards' members who dedicate only a part of their available time to the company in an advisory capacity. *Former* is a dummy variable for former directors (no longer a board member at the time of transaction). Person Dispensing Managerial Responsibility (*PDMR*) is a dummy variable for trades of directors who are not board members but employees considered to be a party to price sensitive information and therefore subject to the same rules as board members. *Chairs* are chairing boards and are predominantly independent directors or firm founders.

Previous studies highlight importance of controlling for directors' characteristics. For example, Chronopoulos et al. (2019) suggest that the trading activity of insiders may not always associate with profit-making motives and can be explained by their level of ownership.[28] We therefore control for directors' holdings and some other characteristics of directors such as directors' gender. Finally, we control for timing of trades. The timing of trades is defined relative to trades of other insiders, relative to lockup expiry, and prevailing market conditions (e.g. periods of market crisis).

[27] *BHARs* are calculated by substracting the market return and compounding it over time.

[28] In line with price-support hypothesis, they report an inverse relationship between the insiders' purchases and future stock returns. Their results could be explained by entrenchment hypothesis (Dyck and Zingales, 2004) predicting that purchases leading to higher concentration of ownership in order to achieve more control (i.e. reduce outside monitoring) would not be seen favourable by other investors.

Variables related to directors' and trades' characteristics therefore are: *Female* is a dummy variable for directors' gender. *T_size* is the size of the director's transaction as a fraction (percentage) of the company's market capitalization at the time of IPO. *D_holdings* are directors' holdings as a fraction (percentage) the company's equity, after the transaction. *O_buy_bef* is a dummy variable for other directors' purchases during a month prior to the directors' purchase. *O_sell_bef* is a dummy variable for other directors' sales during a month prior to the directors' sale. *PE_sell_bef* is a dummy variable for PE firms' sales during a month prior to the directors' sales or purchase respectively. *L_exp_bef* is a dummy variable for transactions that took place before the (director) lock up expiry date. *Crises* is a dummy variable for trades that took place during two crisis periods: internet bubble (1st January 2001 until 31st December 2002) and the most recent financial crisis (1st July 2007 until 31st December 2009).

Previous studies (e.g. Ravina and Sapienza, 2010; Goergen et al., 2018) highlight importance of controlling for firms' effects. Some omitted firm characteristics (e.g. size, industry, quality of governance, etc.) may drive both the choice of directors and their ability to collect information thus creating a selection bias. Anderson et al. (2009) for example predicts firms' worse performance if founders are in control. We therefore expect weaker corporate governance (i.e. more entrenchment) when founders perform dual roles (e.g. founder is either *CEO* or *Chair*). *Dual* is a dummy variable for companies where company's founder performs either an executive (e.g. *CEO*) or a non-executive role (e.g. *Chair*). We also control for firms' size, industry, and market to book value.[29] Firms' fixed effects therefore are: market to book ratio, at the IPO (*MB*). *Size* as natural logarithm of a firm's market capitalisation (in million £). *Services* is a dummy variable for companies from service sector. The above controls for time-invariant differences allow us to compare the performance of trades of various types of insiders belonging to the same firm and facing the same regulatory environment.

We run two separate regressions for different types of executive *(equation 2)* and non-executive directors *(equation 3):*[30]

[29] It is also worth noting that firms' *Size* and *MB* are also use to control for contrarian behaviour in previous literature.

[30] Here we implicitly assume that *CEOs* are better informed than *CFOs (equation 2)* and *Independent* directors are better informed than other non-executive directors. The first assumption is in line with results reported in previous literature (Graham and Harvey, 2001). The second assumption is justified by the fact that *Independent* directors are board members whilst other non-executive directors are not.

$$BHAR_{t,i} = \alpha_i + \beta_1 \cdot CFO_i + \beta_2 \cdot Female_i + \beta_3 \cdot T\_size_i + \beta_4 \cdot D\_holdings_i + \beta_5 \cdot O\_sell\_bef_i + \beta_6 \cdot O\_buy\_bef_i + \beta_7 \cdot PE\_sell\_bef_i + \beta_8 \cdot L\_exp\_bef_i + \beta_9 \cdot Crises_i + \beta_{10} \cdot MCap_i + \beta_{11} \cdot Services_i + \beta_{12} \cdot MB_i + \beta_{13} \cdot Dual\_roles_i + \varepsilon_i \quad (Eq.\ 2)$$

$$BHAR_{t,i} = \alpha_i + \beta_1 \cdot PDMR_i + \beta_2 \cdot Former_i + \beta_3 \cdot Chair_i + \beta_4 \cdot Female_i + \beta_5 \cdot T\_size_i + \beta_6 \cdot D\_holdings_i + \beta_7 \cdot O\_sell\_bef_i + \beta_8 \cdot O\_buy\_bef_i + \beta_9 \cdot PE\_sell\_bef_i + \beta_{10} \cdot L\_exp\_bef_i + \beta_{11} \cdot Crises_i + \beta_{12} \cdot MCap_i + \beta_{13} \cdot Services_i + \beta_{14} \cdot MB_i + \beta_{15} \cdot Dual\_roles_i + \varepsilon_i \quad (Eq.3)$$

The dependent variable in *equation 2* is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of executives' purchases and sales, respectively. *CFO* is a dummy variable for trades of chief finance officers, at the time of transaction. The constant term, α_i, is an implicit measure of how much information *CEOs* have vis-à-vis market. The coefficient β_1 measures the quantity of private information acquired by *CFOs* vis-à-vis *CEOs.*

The dependent variable in *equation 3* is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of non-executives' purchases and sales, respectively. The constant term, α_i, in *equation 3* is an implicit measure of how much information independent directors have vis-à-vis market. The coefficients β_1, β_2, and β_3 measure the quantity of private information acquired by independent directors vis-à-vis *PDMRs, Former, and Chair.*

Finally, we run the following regression for PE firms' sales:

$$BHAR_{t,i} = \alpha_i + \beta_1 \cdot Sindicated_i + \beta_2 \cdot PE\_rep_i + \beta_3 \cdot PE\_holdings_i + \beta_4 \cdot UW\_rep_i + \beta_5 \cdot Complete_i + \beta_6 \cdot Complete*First_i + \beta_7 \cdot T\_PE\_size_i + \beta_8 \cdot L\_PE\_exp\_bef_i + \beta_9 \cdot Crises_i + \beta_{10} \cdot MCap_i + \beta_{11} \cdot Services_i + \beta_{12} \cdot MB_i + \beta_{13} \cdot Dual\_roles_i + \varepsilon_i \quad (Eq.\ 4)$$

The dependent variable in *equation 4* is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of PE firms' sales. The constant term, α_i, is an implicit measure of how much information PE firms have vis-à-vis market. *PE_holdings* are percentage equity holdings of PE firms after the sale. *Complete* is a dummy variable coded one in case of a complete PE firm sale, and zero otherwise. *Complete*First* is an interaction variable coded one in case of the first sale resulting in a complete PE firm's exit, and zero otherwise. *T_PE_size* is size of PE sales as a percentage of firms' market capi-

talization. *L_PE_exp_bef* is a dummy variable for transactions that took place before originally agreed PEs' lock up expiry dates. In addition to transactions' and firms' characteristics, we also control for PE firms' characteristics (e.g. syndicated deals and PE firms' reputation) and reputation of IPO underwriters. *Syndicated* is a dummy variable coded one in case of a syndicated PE investment, and zero otherwise. *PE_rep* is a dummy variable coded one if the PE firm is among top 10 UK most reputable PE firms (based on ranking provided in Jelic, 2011) and zero otherwise. *UW_rep* is a dummy variable coded one if the underwriter of the IPO firm belongs to the top 10 underwriters (based on ranking provided in Migliorati & Vismara, 2014), and zero otherwise.All other variables are same controls used in *equations 1-3.*

6. Results

6.1. Short term price impact of directors' dealings

Results presented in Table 3 (Panel A) clearly depict directors contrarian behaviour. For example, directors tend to purchase after a period of significantly low abnormal returns (-8.87%). The significant positive price effect remains throughout the 20-day event window. For sales, the negative price effect is also statistically significant at 1% level throughout the 20-day event window.

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

Figure 6 highlights the contrarian behaviour of directors' trades showing a characteristic V-shaped distribution of cumulative abnormal returns. The results therefore suggest that directors try to time the market when purchasing and selling their shares.

***** Insert Figure 6 about here *****

We are able to compare our results for all directors' purchases, from IPO date until the end of second year after lockups, with the results of directors dealing in UK IPOs and seasoned companies. For example, Hoque and Lasfer (2015) examine directors' trades in UK IPOs, in a combined sample of IPOs from Main and AIM markets. 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). In our (total) sample of director purchases, abnormal returns are positive (1.56%) and statistically significant at 1%

level. Results for all directors sales produce negative (-0.48%) and significant abnormal returns at the announcement date. The returns remain negative (-3.37%) and statistically significant at the end of the event window (Table 3 – Panel A). Our results therefore contradict Hoque and Lasfer (2015) who report that in the event of sell trades CARs are not constantly negative and significant.[31]

Examination of purchases over three different sub-periods shows a consistent evidence of contrarian trading behaviour. For sales, however, the evidence is less clear. Directors do not exhibit contrarian behaviour during the first period (Table 3 - Panel B). The price impact is also not statistically significant for sales before (originally) scheduled lockup expiry. During the second and third period (Table 3 - Panels C and D), directors' sales exhibit contrarian behaviour and also create a significant price impact (more pronounced during the second year after lockup expiry).

Results for dealings stratified by different types of insiders are presented in Figure 7. Overall, executives *(CEOs and CFOs)* tend to buy after an average abnormal price decrease and sell after an average abnormal price increase (Panels A and B).[32]

***** Insert Figure 7 about here *****

Contrary to the evidence for executive directors, independent directors do not exhibit contrarian behaviour (see Figure 7, Panel C). [33] Former directors clearly exhibit contrarian trading behaviour (Panel D). The price impact is statistically significant for both purchases and sales. [34] Results for *PDMRs* are presented in Panel E. The price impact is statistically significant only for sales.[35]

[31] It is worth mentioning that authors report aggregated (i.e. net) purchases and sales.
[32] Unreported results for purchases show statistically significant price only in first and second period (on announcement day only). For sales, negative price impact is statistically significant only in the first period (i.e., prior to lockup expiry). Unreported results are available upon request from authors.
[33] By sub-periods, the price impact is only present in the second period (for purchases) and third period (for sales). Unreported results are available upon request from authors.
[34] Former directors' purchases also produce statistically significant price impact in all three sub-periods. The significant negative price impact of their sales however is evident only in the third sub-period. Unreported results are available upon request from authors.
[35] Unreported results are available upon request from authors.

6.2. Short term price impact of PEs sales

As shown in Figure 1, the highest number of PE sales was in 2001 and 2015. Overall, we find no evidence that sales follow periods with statistically positive abnormal returns (Table 4 – Panel D). Figure 8 highlights the absence of the evidence for contrarian behaviour of PE firms' sales by showing absence of characteristic V-shaped distribution of abnormal returns, typical of contrarian trading.[36]

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

***** Insert Figure 8 about here *****

In the first period, abnormal returns tend to be negative (-1.40%) and statistically significant at 5% level on the announcement day (Table 4 - Panel A). CARs remain negative, and significant at 1% level, until day +5 (-4.84%). Given the statistically significant abnormal returns, investors do appear to be taken by surprise by premature exercise of lockups. In the subsequent periods (Table 4 - Panels B and C) we find no evidence for a statistically significant price effects. As a next step, we compare the price effects of first and subsequent PE firms' sales. We present the evidence for complete and partial sales separately in Table 5. The results suggest that PE firms prefer partial to complete sales. First sales produce a statistically significant negative impact only when they are partial thus indicating that PE firms are not completely exiting the investment (Table 5 – Panel A).

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

7. Informativeness of insiders' trades

7.1. Directors' trades

Results reported in Table 6 suggest that, on average, mimicking executives' sales yield statistically significant market adjusted returns, 30 and 90 days after disclosure of sales (Panel A). Independent directors earn significantly less than executive directors for all holding periods. The respective coefficients for *PDMR* and *Former* directors are also negative, but not statistically significant.[37] On average, mimicking *Chair's* sales tend to generate higher returns than

[36] In case the estimation window is too small (below 200 trading days) corresponding PE firm sale transactions are excluded. Therefore the number of transactions used is reduced to 222 (from 226) PE firm sales in the total sample (Panel D) and to 48 (from 52) sales in the period IPO date to date of lockup expiry (Panel A).

[37] An exception is the coefficient for *PDMR* categorical variable exhibiting 10% level of statistical significance in the model for 180 days after disclosure.

the respective executives' sales but the difference is not statistically significant.[38] Sales before lockup expiry generate significantly lower returns on the disclosure date and 30 days later.[39] Sales during crises periods generate significantly lower returns in the model for 90-day horizon.

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

On average, mimicking executives' purchases yields statistically significant market adjusted returns (Panel B). For example, mimicking executive purchases yields a 0.63005% market-adjusted return over 360 days. On average, mimicking independent directors' purchases yields lower returns compared to executive trades but the difference in mean returns for executives and independent directors is not statistically significant.[40] Purchases before lockup expiry generate significantly lower returns. Purchases during crisis periods tend to generate significantly higher returns, in line with the contrarian trading strategy.

To interpret economic significance of our results we multiple average (mean) size of executives' sales/purchases (£3670884/2,659,813) with the constant term (0.15899/0.63005) in respective regressions, for 360 days. The results provide an average pound profit from executives' sales (£583,634) and purchases (£1,675,815), respectively. The economic significance is therefore much higher for purchases than sales. The result is expected since purchases tend to be more information driven. Overall, the results lend strong support to our hierarchy hypothesis.

Results for *equation 2* are presented in Table 7. Both *CEOs* and *CFOs* profit from sales (holding periods of 30 and 180 trading days in Panel A).

***** Insert Table 7 about here *****

There is however no statistically significant differences between *CEOs* and *CFOs*. *BHARs* tend to be higher when executives sell shortly after other sale transactions. *BHAR (30)* tend to be lower for executives' sales when executives' holdings are larger. Overall, executives do

[38] An exception is the coefficient for *Chair* categorial variable exhibiting 10% level of statistical significance in the emodel for 180 days after disclosure.
[39] Note negative constant and positive sign for *L_exp_bef* in the model, t=0.
[40] Independent and *PDMR* earn significantly less in models for 90 and 30 days respectively but only at 10% level of statistical significance.

not profit from purchases (Panel B). *CEOs* actually make a significant loss when they purchase (at t=0). [41] *CFOs* do better than *CEOs* when they purchase at time 0. Larger and executives' purchases where executives holdings are higher, tend to be associated with larger *BHAR* (at t= 0). Purchases before lockup expiry tend to generate lower *BHARs* (although statistically significant only at 10%, in models for 90 and 360 trading days).

Results for *equation 3* are presented in Table 8. Independent directors do not profit from sales. There are no statistically significant differences between informativeness of independent directors' trades and trades of other non-executive directors *(PDMR, Chair, and Former).*

***** Insert Table 8 about here *****

Buy and hold market adjusted abnormal returns are lower for sales following other directors' sales, before lockup expiry, and for sales during crises. Independent directors significantly profit from purchases (Panel B). The differences in informativeness of trades between different types of non-executive directors are not statistically significant. *BHARs* are lower when purchases occur after other directors' and PE sales. *BHARs* are also statistically lower for purchases before scheduled lockup expiries.

7.2. PE firms' sales

The results for PE firms' sales are presented in Table 9. As expected, the constant term is not statistically significant thus suggesting that PE firms do not trade based on superior information vis-à-vis market. PE firms' sales tend to be motivated by portfolio diversification and need to exit investments and invest in new deals. More reputable PE firms tend to perform better *(*e.g. model for *BHAR30).* In line with the evidence provided for directors, PE sales before scheduled lockup expiries tend to perform particularly badly *(*e.g. models for *BHAR90* and *BHAR180).* Same applies for sales during crises *(*e.g. model for *BHAR30).* After controlling for characteristics of PE firms, trades, and firms, we do not find significant differences between the performance of complete and partial sales.

[41] As indicated earlier, executives are regulated and monitored and they are very cautious to trade which explains that they are not traded as frequently as non-executives. Further explanations as why executives' trades are not even more profitable is that they often receive share options. It is therefore plausible that executives achieve higher returns in options market.

***** Insert Table 9 about here *****

8. Robustness checks

We check for the robustness of the results by controlling for the fact that non-executive trades, on average, tend to be larger from the non-executive trades (as reported in Table 3). Since bigger transactions tend to create a stronger incentive to trade better, the difference in mean returns between executives and non-executive directors could be biased downward. We therefore control for transaction size, shareholdings, and the interaction between these variables *(Non-executives*T_size* and *Non-executives*D_holdings.* We than compare the results in the respective models with *(Equation 5)* and without interaction terms *(Equation 6):*

$$BHAR_{t,i} = \alpha_i + \beta_1 \cdot Non\text{-}executives_i + \beta_2 \cdot Non\text{-}executives*T\_size_i + \beta_3 \cdot Non\text{-}executives*D\_holdings_i + \beta_4 \cdot Female_i + \beta_5 \cdot T\_size_i + \beta_6 \cdot D\_holdings_i + \beta_7 \cdot O\_sell\_bef_i + \beta_8 \cdot O\_buy\_bef_i + \beta_9 \cdot PE\_sell\_bef_i + \beta_{10} \cdot L\_exp\_bef_i + \beta_{11} \cdot Crises_i + \beta_{12} \cdot MCap_i + \beta_{13} \cdot Services_i + \beta_{14} \cdot MB_i + \beta_{15} \cdot Dual\_roles_i + \varepsilon_i \quad (Eq.\ 5)$$

$$BHAR_{t,i} = \alpha_i + \beta_1 \cdot Non\text{-}executives_i + \beta_2 \cdot Female_i + \beta_3 \cdot T\_size_i + \beta_4 \cdot D\_holdings_i + \beta_5 \cdot O\_sell\_bef_i + \beta_6 \cdot O\_buy\_bef_i + \beta_7 \cdot PE\_sell\_bef_i + \beta_8 \cdot L\_exp\_bef_i + \beta_9 \cdot Crises_i + \beta_{10} \cdot MCap_i + \beta_{11} \cdot Services_i + \beta_{12} \cdot MB_i + \beta_{13} \cdot Dual\_roles_i + \varepsilon_i \quad (Eq.\ 6)$$

Unreported results for sales are consistent in the respective models with and without interaction variables.[42] For example, mimicking the exectuves‘ sales generates statistically significant returns in models for 30 and 90 days. As expected, the differences in mean returns between executives and non-executives however is not statistically significant both in models with and without interaction terms.[43] In general, the size of the sale does not affect returns. An exception is a positive and statistically significant coefficeint for size in the model for 30 days, with interaction terms. The negative and statistically significant coefficient for the interaction term *(Non-executives*T_size),* in the same model, indicates that mimicking smaller non-executives' sales yield lower returns than mimicking larger non-executive sales. The positive and statistically significant coefficient for the second interaction term *(Non-executives*D_holdings),* in the same model, indicates that mimicking non-executives with larger holdings yields higher returns than mimicking non-executives with smaller holdings.

[42] Unreported results are available upon request from authors.

[43] The mean value for executive directors' sales is £3,670,884 compared to the mean of £16,727,298 for independent directors. Given larger average sales of independent than executive directors in our sample the difference in mean returns between these two groups could be biased downward. Aggregating independent directors with other groups of non-executive directors (i.e. *PDMR, Former, Chair*) thus would not create an upward bias thus affecting previously reported results indicating lack of significant differences between executives and other non-executive groups.

The results for purchases are consistent in the respective models with and without additional controls for size and stock holdings.[44] For example, mimicking the executives' purchases yields statistically significant returns. Interestingly, executives (on average) make larger purchases than independent directors.[45] Consequently, the difference in mean returns between these two groups could be biased upward which could have affected results reported in Table 6 (Panel B). However, the difference in mean returns between executive and non-executive directors remains insignificant after controlling for size of purchases and directors' stock holding. As expected, the coefficient for size of purchases is negative and does affect returns especially for longer horizons (90, 180 and 360 days). The interaction variables (*Non-executives*T_size* and *Non-executives*D_holdings*) are positive and statistically significant in those regressions indicating that non-executives with larger purchases and stock holdings do better compared to the non-executives with smaller purchases and stock holdings. The results for directors' stock holdings are in line with the hypothesis that non-executives (e.g. independent directors) need to make an effort to get information, while executives receive information effortlessly due to their roles in the firm. The higher the stock holdings the stronger is the incentive for non-executive to search for and to acquire information.

9. Conclusion

Our 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) (see Cumming et al., 2015). MAR provisions became effective in 2016 and introduced a number of changes especially in the areas of disclosure of inside information to the market, disclosure of dealings by former directors, and maintenance of insider lists by firms (see Norton Rose Fulbright, 2016). Several 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. Lockups and cornerstone investors are recommended as principal routes for achieving

[44] Unreported results are available upon request from authors.

[45] The mean value for executives' purchases are £2,659,813 compared to mean value of purchases of independent directors of £399,448. Our result differs from Ravina and Sapienza (2010) who report that independent directors make larger purchases than executives.

formal long term commitments.[46] For example, Myners et al. (2014) highlight the importance of a long term shareholder register. This was echoed by some of the leading institutional investors arguing for lengthening incentive schemes in order to prevent short-termism.[47]

The mean (median) sample lock up period for directors is 406 (365) calendar days. Lockups for PE firms tend to be shorter with a mean (median) of 224 (180) calendar days. Overall, our results suggest that insiders (both managers and PE firms) do not rush to sell their shares after lockup expiry. For example, PE firms sell their locked shares in instalments and hold some stakes in 45% of IPOs more than two years after lockup expires. We do however find evidence of an increase in the number of IPOs where underwriters allow lockup restrictions to prematurely lapse for some investors. The number of these cases particularly increased since most recent financial crisis in 2008.

We document significant differences in the short term price impact of directors' transactions and dealings of PE firms before and during the 2-year period after lockup expiry. Our results reveal that directors' sales in the first one to two years after the IPO do not produce the short term price impact. Only during the second year after lockup expiry date, directors' sales disclosures generate (immediately on the disclosure date) a significant negative price impact. Contrary to sales, directors' purchases always are associated with an immediate significant (positive) price impact. The sustainability of this positive price impact increases the further afar a purchases transaction is from the IPO date. A comparison of executive and non-executive directors reveals that non-executive directors' trades (purchases as well as sales) are not very informative (no significant price impact) for the market. On the other hand, the opposite is true for executive directors' transactions (overall +2.4% (significant) price impact for purchases and -0.8% (significant) negative price impact for sales). This price impact increases the further afar from the IPO date transactions take place.

Measured by buy-and-hold market adjusted returns, executives profit from both purchases and sales. Executives profit more from purchases during crises periods. Executives do not profit significantly different from non-executives except when they sell. Their sales generate significantly higher abnormal returns compared to independent directors. *CEOs* profit from

[46] 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).
[47] Fidelity Worldwide Investment, for example, requires from executives of their portfolio companies to hold shares longer than 3 years before cashing them in (BBC, 24th September 2013).

sales and purchases. *CFOs* profit more than *CEOs* only from purchases. Independent directors do not profit from sales but do profit from purchases. Independent directors do not profit differently from other non-executive directors *(PDMR, Chair, Former).*

The majority of PE firms sell their locked shares in instalments. Their (cumulative) holdings decrease continuously from a mean value of 29.6% (of shares outstanding) immediately after the IPO date to an average of 9.0% two years after the lockup expiry date. Before lockup expiry they already tend to reduce their (cumulative) holdings by 5.3 percentage points, and are selling most during the year after lockup expiry (11.3 percentage points). Unlike directors' sales, sales of PE firms generate a negative and significant price impact prior to lockup expiry (-1.4% on the reporting date, -4.8% until 5 days after the reporting date). This indicates that PE firms' sales taking place before the end of the originally reported selling ban period leaves investors surprised, generating a clear negative effect on the market value of the corresponding IPO firms. After the lockup expiry, and also in contrast to directors' sales, PE sales do not generate any (significant) negative price impact, regardless whether they take place immediately (during the first year after lockup expiry) or later (during the second year after lockup expiry). It seems that PE sales beyond the lockup expiry date reported in the IPO prospectus are expected by investors and therefore already priced in.

Overall, our analyses reveal that in many cases (for directors and especially PE firms) lockup arrangements are waived by underwriters, resulting in significant and negative price impacts. This is clearly not an advantage for investors but probably for directors and especially PE firms. In some cases the waivers are given a long time before the lockup expiry. This practice may allow insiders to use their information and trade before the lockup expiry, thus, circumventing the trading ban. It is important to note that IPO prospectuses do not contain information about the circumstances in which any sale might take place prior to its expiry. There is also no disclosure regarding the extent to which any period of the lockup may be broken at the sole discretion of the investment bank (i.e. soft lock-up).[48] On a positive side, our evidence suggests that neither directors nor PEs rush to sell their shares after lockup expiry. Overall all insiders profit less from trades before lockup expiry. Therefore, we find no evidence of the alleged short-termism associated with insiders in UK firms.

[48] Association of British Insurers (2014) members consider recent popularity of soft lock-ups, and lack of disclosure in IPO prospectuses, unwelcome.

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Table 1: Sample selection process

This table presents the sample selection process for IPOs and insider transactions. The IPO sample selection process is exhibited in Panel A. Data on LSE new issue statistics is from: http://www.londonstockexchange.com /statistics/new-issues-further-issues/new-issues-further-issues.htm. In total, 466 IPOs from insurance (11), real estate (20), investment companies and entities (235), equity and non-equity investment instruments (151) and banking and finance (49), are excluded. Panel B provides the directors' dealings sample selection process. Data on directors' deals (DD) is from Smart Insider (https://www.smartinsider.com). Transactions related to preferred shares, various transfers, option exercises, and dividend related transactions are excluded. Panel C presents the Private Equity (PE) sales sample selection process. Data on lockups (lockups for directors and lockups for PE firms) is manually collected from IPO prospectuses. Data for PE firms' transactions is manually collected from the sample companies' notifications. IPO prospectuses and companies notifications are obtained from Perfect Information Navigator database.

Panel A: IPO Sample selection

	Number of IPOs
All IPOs on LSE main market (1999-2014)	851
- IPOs incorporated outside UK	-168
All UK IPOs on LSE main market (1999-2014)	683
- IPOs from finance, insurance, real estate and investment companies	-466
All UK Non-Financial IPOs on LSE Main Market (1999-2014)	**217**

Panel B: Directors' Dealings (DD) sample selection

		DD transactions (1999-2017)		
	No. of IPOs	**All trades**	**Purchases**	**Sales**
All UK Non-Financial IPOs on LSE Main Market (1999-2014)	217			
- IPOs with no Directors' Dealings	-24			
All UK Non-Financial IPOs with Directors' Dealings	193	4189	2785	1404
- IPOs with no lockup for directors (no DDLU)	-7	-308	-187	-121
All UK Non-Financial IPOs with Directors' Dealings, with a lockup date for directors	186	3881	2598	1283
- All DD transactions after 2 years post DDLU expiry	-13	-2349	-1647	-712
All UK Non-Financial IPOs with Directors' Dealings, with a lockup date for directors, between IPO and 2 years after DDLU	173	1532	951	571
- All DD transactions with missing return data	-1	-1	0	-1
Final Directors' Dealings sample	**172**	**1531**	**951**	**570**

Panel C: Private Equity (PE) sales sample selection

	No. of IPOs	**No. of PE Sales**
All UK Non-Financial IPOs on LSE Main Market (1999-2014)	217	
- IPOs with no PE Sales	-131	
All UK Non-Financial IPOs with PE Sales	86	324
- IPOs with no lockup for PE firms	-6	-36
All UK Non-Financial IPOs with PE Sales, with a lockup date for PE firms	80	288
- All PE Sales after 2 years post lockup expiry	-8	-61
All UK Non-Financial IPOs with PE Sales, with a lockup date for PE firms, between IPO and 2 years after lockup expiry	72	227
- All PE Sales with missing return data	0	-1
Final PE sales sample	**72**	**226**

Table 2: Timing of insiders transactions

This Table presents the number of directors' transactions (sales and purchases) as well as PE firms' transactions (sales) for four periods: (i) The total period from IPO date until the end of the second year after lockup expiry, (ii) the first sub-period (from IPO date until lockup expiry date), (iii) the second sub-period (from lockup expiry date until the end of the first year after the lockup expiry date), and (iv) the third sub-period (from one year after the lockup expiry date until the end of the second year after the lockup expiry date).

	Directors' trades		**PE firms' sales**
	Sales	Purchases	
Prior to LU	134 (23.5%)	270 (28.4%)	52 (23.0%)
Post LU:			
During 1st year	260 (45.6%)	401 (42.2%)	120 (53.1%)
During second year	176 (30.9%)	280 (29.4%)	54 (23.9%)
All post IPO	570 (100%)	951 (100%)	226 (100%)

Table 3: Price impact of directors' dealings

Panel A represents CARs for directors' trades prior to lockup dates (originally disclosed in IPO prospectuses), Panel B during the first year post lockup dates, Panel C during the second year after lockup dates, and Panel D reveals CARs for all directors' trades until the end of the second year after lockup dates, respectively. Day t=0 in the event window is the disclosure date of director trades. CARs are the cumulative abnormal returns of the corresponding sub-sample and the corresponding period within the event window. They are based on the market model adjusted return approach. N is the number of directors' transactions (total, positive, negative). The reported test statistics are the standardized cross sectional t-test (*SCS-Test*) based on Boehmer et al. (1991) and the Corrado and Zivney (1992) *Rank-Test*. ** significant at the 1% level (if both test statistics are at or below a p-value of 0.01), * significant at the 5% level (if both test statistics are at or below a p-value of 0.05).

Panel A: Total sample (IPO date to the end of the second year after lockup expiry)

	Purchase (N = 932)				**Sales (N = 567)**			
Event Window	-20 to -1	0	0 to +5	0 to +20	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-8.87**	1.56**	3.28**	4.97*	2.08**	-0.48**	-1.47**	-3.37**
N (CAR > 0:CAR < 0)	328:604	566:366	549:383	491:441	340:227	221:346	192:375	215:352
SCS-Test	-8.61	6.67	7.08	4.09	5.14	-5.36	-5.79	-5.56
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rank-Test	-5.51	4.98	4.27	2.34	3.31	-2.62	-3.38	-4.05
p-value	0.0000	0.0000	0.0000	0.0194	0.0009	0.0087	0.0007	0.0001

Panel B: IPO date to date of lockup expiry

	Purchase (N = 251)				**Sales (N = 131)**			
Event Window	-20 to- 1	0	0 to +5	0 to +20	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-6.53*	1.03**	1.86**	2.65	-1.46	-0.42	-1.94	-5.72
N (CAR > 0:CAR < 0)	75:176	147:104	155:96	124:127	60:71	51:80	45:86	47:84
SCS-Test	-2.21	3.48	3.26	1.49	-0.96	-1.34	-1.93	-3.77
p-value	0.0269	0.0005	0.0011	0.1356	0.3376	0.1792	0.0537	0.0002
Rank-Test	-2.49	2.82	3.31	1.14	0.18	-0.31	-0.72	-1.75
p-value	0.0129	0.0049	0.0009	0.2533	0.8577	0.7534	0.4686	0.0798

Panel C: During the first year after lockup expiry

	Purchase (N = 401)				Sales (N = 260)			
Event Window	-20 to- 1	0	0 to +5	0 to +20	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-8.27**	1.98**	3.43*	5.73	2.55**	-0.42	-0.86*	-1.02
N (CAR > 0:CAR < 0)	160:241	251:150	237:164	209:192	168:92	110:150	96:164	104:156
SCS-Test	-7.01	5.34	4.37	3.68	4.28	-3.61	-3.18	-2.02
p-value	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0015	0.0437
Rank-Test	-3.87	3.88	1.96	1.60	2.77	-1.69	-2.06	-1.80
p-value	0.0001	0.0001	0.0495	0.1104	0.0056	0.0911	0.0396	0.0714

Panel D: During the second year after lockup expiry

	Purchase (N = 280)				Sales (N = 176)			
Event Window	-20 to -1	0	0 to +5	0 to +20	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-11.84**	1.44**	4.33**	5.97	4.02**	-0.60**	-2.02**	-5.09**
N (CAR > 0:CAR < 0)	93:187	168:112	157:123	158:122	112:64	60:116	51:125	64:112
SCS-Test	-6.56	2.67	4.63	2.35	5.04	-4.18	-5.49	-4.01
p-value	0.0000	0.0076	0.0000	0.0188	0.0000	0.0000	0.0000	0.0001
Rank-Test	-4.68	3.23	3.51	1.96	3.45	-3.22	-3.87	-4.35
p-value	0.0000	0.0013	0.0004	0.0503	0.0006	0.0013	0.0001	0.0000

Table 4: Price impact of PE firms' sales

Panel A represents CARs for PE firms' sales prior to lockup dates (originally disclosed in IPO prospectuses), Panel B during the first year post lockup dates, Panel C during the second year after lockup dates, and Panel D reveals CARs for all PE firms' sales until the end of the second year after lockup dates, respectively. Day t=0 in the event window is the disclosure date of PE firms' sales. CARs are the cumulative abnormal returns of the corresponding sub-sample and the corresponding period within the event window. They are based on the market model adjusted return approach. N is the number of PE firms' sales (total, positive, negative). The reported test statistics are the standardized cross sectional t-test (*SCS-Test*) based on Boehmer et al. (1991) and the Corrado and Zivney (1992) *Rank-Test*. ** significant at the 1% level (if both test statistics are at or below a p-value of 0.01), * significant at the 5% level (if both test statistics are at or below a p-value of 0.05).

Panel A: IPO date to date of lockup expiry

	N = 48			
Event Window	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-3.72	-1.40*	-4.84**	-11.47
N (CAR > 0:CAR < 0)	22:26	15:33	19:29	12:36
SCS-Test	-0.34	-3.10	-2.81	-2.89
p-value	0.7354	0.0019	0.0050	0.0038
Rank-Test	1.15	-2.15	-3.05	-1.12
p-value	0.2495	0.0318	0.0023	0.261

Panel B: During the first year after lockup expiry

	N = 120			
Event Window	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-0.58	-0.42	-0.34	-2.72
N (CAR > 0:CAR < 0)	67:53	52:68	56:64	64:56
SCS-Test	1.19	-1.53	0.33	-0.57
p-value	0.2359	0.1264	0.7428	0.5664
Rank-Test	0.27	-1.00	0.69	0.86
p-value	0.7898	0.3193	0.4925	0.3898

Panel C: During the second year after lockup expiry

	N = 54			
Event Window	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	5.49*	-0.15	0.37	-1.41
N (CAR > 0:CAR < 0)	37:17	29:25	26:28	23:31
SCS-Test	2.42	-0.75	0.10	-0.41
p-value	0.0155	0.4548	0.9214	0.6826
Rank-Test	2.14	0.12	0.80	0.83
p-value	0.0321	0.9045	0.4256	0.4069

Panel D: IPO date to the end of the second year after lockup expiry

	N = 222			
Event Window	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-0.58	-0.42	-0.34	-2.72
N (CAR > 0:CAR < 0)	67:53	52:68	56:64	64:56
SCS-Test	1.19	-1.53	0.33	-0.57
p-value	0.2359	0.1264	0.7428	0.5664
Rank-Test	0.27	-1.00	0.69	0.86
p-value	0.7898	0.3193	0.4925	0.3898

Table 5: Comparison of PE firms' complete and partial sales

Panel A represents CARs for PE firms' first sales and Panel B for PE firms' subsequent sales, respectively. Day t=0 in the event window is the disclosure date of PE firms' sales. CARs are the cumulative abnormal returns of the corresponding sub-sample and the corresponding period within the event window. They are based on the market model adjusted return approach. N is the number of PE firms' sales (total, positive, negative). The reported test statistics are the standardized cross sectional t-test (*SCS-Test*) based on Boehmer et al. (1991) and the Corrado and Zivney (1992) *Rank-Test*. ** significant at the 1% level (if both test statistics are at or below a p-value of 0.01), * significant at the 5% level (if both test statistics are at or below a p-value of 0.05).

Panel A: PE firms' first sales

	Complete (N = 25)				**Partial (N = 65)**			
Event Window	-20 to -1	0	0 to +5	0 to +20	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	9.71*	0.52	1.33	0.08	-2.70	-1.18*	-4.41**	-9.40
N (CAR > 0:CAR < 0)	21:04	15:10	19:06	19:06	31:34	22:43	24:41	18:47
SCS-Test	3.93	0.68	1.83	0.32	-0.02	-2.93	-3.65	-3.82
p-value	0.0001	0.4940	0.0673	0.7471	0.9880	0.0034	0.0003	0.0001
Rank-Test	2.05	0.54	0.47	0.92	1.16	-1.96	-2.86	-1.08
p-value	0.0403	0.5913	0.6413	0.3601	0.2458	0.0495	0.0042	0.2811

Panel B: PE firms' subsequent sales

	Complete (N = 23)				**Partial (N = 109)**			
Event Window	-20 to -1	0	0 to +5	0 to +20	-20 to -1	0	0 to +5	0 to +20
CAR (in %)	-0.78	0.69	1.32	-0.31	0.00	-0.72	-0.27	-3.09
N (CAR > 0:CAR < 0)	10:13	8:15	13:10	10:13	64:45	51:58	45:64	52:57
SCS-Test	-1.03	0.09	0.88	0.32	1.10	-2.30	0.09	-0.62
p-value	0.3010	0.9300	0.3809	0.7526	0.2728	0.0214	0.9256	0.5346
Rank-Test	-0.10	-1.08	0.50	0.93	0.15	-1.05	0.91	0.61
p-value	0.9194	0.2808	0.6171	0.3514	0.8823	0.2930	0.3603	0.5448

Table 6: Directors' trades: buy-and-hold market-adjusted returns *(BHAR)*

The dependent variable is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of (all) directors sales (Panel A) and purchases (Panel B). *Constant* term is an implicit measure of how much information executive and non-executive directors have vis-à-vis market. *Independent* is a dummy variable for independent directors who are boards' member providing an advisory role. *Chair* is a dummy variable for a person chairing boards of directors. *Former* is a dummy variable for former directors (i.e. no longer a board member at the time of transaction). Person Dispensing Managerial Responsibility (*PDMR*) is a dummy variable for trades of directors who are not board members but employees considered to be a party to price sensitive information. *Female* is a dummy variable for directors' gender. *T_size* is the size of the director's transaction as a fraction (percentage) of the company's market capitalization at the time of IPO. *D_holdings* are directors' holdings as a fraction (percentage) the company's equity, after the transaction. *O_buy_bef* is a dummy variable for other directors' purchases during a month prior to the directors' purchase. *O_sell_bef* is a dummy variable for other directors' sales during a month prior to the directors' sale. *PE_sell_bef* is a dummy variable for PE firms' sales during a month prior to the directors' sales or purchase respectively. *L_exp_bef* is a dummy variable for transactions that took place before the (director) lock up expiry date. *Crises* is a dummy variable for trades that took place during two crisis periods: internet bubble in early 2000s (1st January 2001 until 31st December 2002) and the most recent financial crisis (1st July 2007 until 31st December 2009). Firms' fixed effects are: market to book ratio, at the IPO (*MB*). *Size* as natural logarithm of a firm's market capitalisation (in million £). *Dual* is a dummy variable for companies where company's founder performs either an executive (e.g. *CEO*) or a non-executive role (e.g. *Chair*). *Services* is a dummy variable for companies from service sector. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Market-adjusted returns of holding the individual position *(BHAR)*									
	Panel A: Directors' sales					**Panel B: Directors' purchases**				
	$BHAR_0$	$BHAR_{30}$	$BHAR_{90}$	$BHAR_{180}$	$BHAR_{360}$	$BHAR_0$	$BHAR_{30}$	$BHAR_{90}$	$BHAR_{180}$	$BHAR_{360}$
Constant	-0.00209	0.11357***	0.13417**	0.19339	0.15899	0.02817**	0.07887	0.13702	0.32902**	0.63005***
Independent	-0.00261	-0.05687**	-0.14277***	-0.31763***	-0.25313**	-00349	-0.03552	-0.10167*	-0.10431	-0.22207
Chair	0.00892	0.03535	0.04030	0.11641*	0.75852	-0.00457	-0.00106	0.04391	0.07005	0.14585
PDMR	0.00248	-0.00921	-0.03326	-0.12867*	-0.06389	-0.00892	-0.07012*	-0.10085	-0.04111	-0.18333
Former	0.00161	-0.00819	-0.01856	-0.05070	-0.01134	0.00153	-0.02757	-0.08133	-0.05038	-0.08358
Female	0.00196	-0.00597	-0.02293	0.01637	0.02941	-0.00829	-0.05183*	-0.10462**	-0.10868	-0.01471
T_size	0.00055	0.00561	0.00053	-0.00299	-0.00044	-0.00544	-0.03041***	-0.00595	-0.00400	0.00526
D_Holdings	-0.00009	-0.00281	-0.00267	-0.00019	0.00294	0.00215	0.00827**	-0.00062	-0.00003	0.00595
O_sell_bef_1	0.00016	-0.04653**	-0.01829	-0.06019	-0.03271	-0.03846**	-0.11970***	-0.15896**	-0.19746**	-0.29887**
O_buy_bef_1	0.00933	0.04203	0.13838*	0.06216	0.18004	0.00114	-0.00513	0.07197	0.02267	0.00720
PE_sell_bef_1	0.00352	0.00002	-0.00464	0.04649	0.16120*	-0.01585***	-0.07409***	-0.09923**	-0.16772*	-0.31091
L_exp_bef	0.00742***	-0.03062**	-0.04297	-0.03229	0.07471	-0.00639	-0.03837**	-0.13305***	-0.22289***	-0.28776***
Crises	-0.00683**	-0.02669	-0.12286***	-0.06605	0.05526	-0.00837*	0.00855	-0.02029	0.03482	0.27275***
Firm_fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj_R^2 (%)	5.30	6.94	8.89	5.04	4.81	8.76	9.20	6.02	5.18	8.48
N	526	526	526	526	526	841	841	841	841	841

Table 7: Executive directors' trades: buy-and-hold market-adjusted returns *(BHAR)*

The dependent variable is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of (all) executive directors' sales (Panel A) and purchases (Panel B). *Constant* term is an implicit measure of how much information chief executive officer *(CEO)* has vis-à-vis market. *CFO* is a dummy variable for chief financial officer. *Female* is a dummy variable for directors' gender. *T_size* is the size of the director's transaction as a fraction (percentage) of the company's market capitalization at the time of IPO. *D_holdings* are directors' holdings as a fraction (percentage) the company's equity, after the transaction. *O_buy_bef* is a dummy variable for other directors' purchases during a month prior to the directors' purchase. *O_sell_bef* is a dummy variable for other directors' sales during a month prior to the directors' sale. *PE_sell_bef* is a dummy variable for PE firms' sales during a month prior to the directors' sales or purchase respectively. *L_exp_bef* is a dummy variable for transactions that took place before the (director) lock up expiry date. *Crises* is a dummy variable for trades that took place during two crisis periods: internet bubble in early 2000s (1st January 2001 until 31st December 2002) and the most recent financial crisis (1st July 2007 until 31st December 2009). Firms' fixed effects are: market to book ratio, at the IPO (*MB*). *Size* as natural logarithm of a firm's market capitalisation (in million £). *Dual* is a dummy variable for companies where company's founder performs either an executive (e.g. *CEO*) or a non-executive role (e.g. *Chair*). *Services* is a dummy variable for companies from service sector. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Market-adjusted returns of holding the individual position (*BHAR*)									
	Panel A: Executive directors' sales					**Panel B: Executive directors' purchases**				
	$BHAR_0$	$BHAR_{30}$	$BHAR_{90}$	$BHAR_{180}$	$BHAR_{360}$	$BHAR_0$	$BHAR_{30}$	$BHAR_{90}$	$BHAR_{180}$	$BHAR_{360}$
Constant	0.02607	0.25147**	0.30167	0.77180**	0.49067	-0.04863**	0.06716	-0.05912	-0.03442	0.38137
CFO	-0.00572	-0.02374	0.00825	0.02685	0.27825	0.02505**	0.04240	-0.02035	-0.04599	0.02956
Female	0.17254*	-0.02403	-0.00941	0.02254	-0.00315	-0.00917	-0.01427	-0.09228	-0.16916	-0.53559**
T_size	0.00012	0.03644*	-0.00025	-0.08981	-0.11013	0.32392**	-0.67609	-1.20722	-1.65643	-1.82313*
D_holdings	0.00003	-0.00797***	-0.00409	0.00122	0.00643	0.00170	0.01418**	-0.00194	-0.00193	-0.01272
O_sell_bef_1	0.00530	-0.01701	0.09829	0.26748*	0.66477***	0.00866	-0.06189	0.20194	-0.04361	-0.20850
O_buy_bef_1	0.01585	-0.10214	0.04905	-0.10259	-0.52012	-0.01148	0.03761	0.16726	0.07601	0.10572
PE_sell_bef_1	0.00107	-0.04740	0.09996	0.17728	-0.21293	-0.03784*	-0.12885	-0.28507	-0.02345	-0.13617
L_exp_bef	0.00409	0.00015	0.03087	0.20407	0.52412*	0.00576	-0.02952	-0.18703*	-0.20622	-0.40742*
Crises	-0.00721	-0.08005	-0.20044	-0.25083	-0.07387	0.00427	0.08158	0.17376	0.17047	0.20233
Firm_fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj_R^2 (%)	14.09	11.09	32.20	33.41	36.66	15.63	39.03	16.67	9.33	10.12
N	61	61	61	61	61	104	104	104	104	104

Table 8: Non-Executive directors' trades: buy-and-hold market-adjusted returns *(BHAR)*

The dependent variable is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of (all) non-executive directors' sales (Panel A) and purchases (Panel B). *Constant* term is an implicit measure of how much information *Independent* directors have vis-à-vis market. *Former* is a dummy variable for former directors (i.e. no longer a board member at the time of transaction). Person Dispensing Managerial Responsibility (*PDMR*) is a dummy variable for trades of directors who are not board members but employees considered to be a party to price sensitive information. *Female* is a dummy variable for directors' gender. *T_size* is the size of the director's transaction as a fraction (percentage) of the company's market capitalization at the time of IPO. *D_holdings* are directors' holdings as a fraction (percentage) the company's equity, after the transaction. *O_buy_bef* is a dummy variable for other directors' purchases during a month prior to the directors' purchase. *O_sell_bef* is a dummy variable for other directors' sales during a month prior to the directors' sale. *PE_sell_bef* is a dummy variable for PE firms' sales during a month prior to the directors' sales or purchase respectively. *L_exp_bef* is a dummy variable for transactions that took place before the (director) lock up expiry date. *Crises* is a dummy variable for trades that took place during two crisis periods: internet bubble in early 2000s (1st January 2001 until 31st December 2002) and the most recent financial crisis (1st July 2007 until 31st December 2009). Firms' fixed effects are: market to book ratio, at the IPO (*MB*). *Size* as natural logarithm of a firm's market capitalisation (in million £). *Dual* is a dummy variable for companies where company's founder performs either an executive (e.g. *CEO*) or a non-executive role (e.g. *Chair*). *Services* is a dummy variable for companies from service sector. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Market-adjusted returns of holding the individual position *(BHAR)*									
	Panel A: Non-Executive directors' sales					**Panel B: Non-Executive directors' purchases**				
	$BHAR_0$	$BHAR_{30}$	$BHAR_{90}$	$BHAR_{180}$	$BHAR_{360}$	$BHAR_0$	$BHAR_{30}$	$BHAR_{90}$	$BHAR_{180}$	$BHAR_{360}$
Constant	-0.00290	0.07484*	0.08172	0.07202	0.14621	0.03255**	0.09568**	0.11445	0.34110**	0.43597*
PDMR	0.00147	0.01704	0.03101	0.01840	0.03192	-0.00586	-0.04250	-0.02120	0.06416	-0.08297
Former	0.00115	0.01663	0.04187	0.09267	0.08868	0.00505	0.02838	0.01836	0.03275	0.02840
Chair	0.00803	0.02491	0.02924	0.09815	0.04801	-0.00406	0.04244	0.06656	0.07367	0.03879
Female	0.00169	0.00244	-0.01274	0.04422	0.10404	-0.00660	-0.04755	-0.10555**	-0.10754	-0.00740
T_size	0.00064	0.00125	-0.00168	-0.00628	-0.00105	-0.00587**	-0.00016	0.00894	0.00585	-0.06174*
D_holdings	-0.00024	0.00072	-0.00081	0.00393	0.00566	0.02275**	-0.00064	-0.00239	-0.00031	0.03251***
O_sell_bef_1	-0.00055	-0.05376**	-0.03973**	-0.11558**	-0.13027*	-0.04146**	-0.11212**	-0.19062**	-0.21818**	-0.33930**
O_buy_bef_1	0.00903	0.05151	0.14868	0.08315	0.21636	0.00215	-0.00394	0.06511	0.01889	-0.02410
PE_sell_bef_1	0.00271	0.00296	-0.01837	0.02467	0.15220*	-0.01397**	-0.08023***	-0.11825***	-0.21127**	-0.36174*
L_exp_bef	0.00741**	-0.03639**	-0.05828*	-0.08462*	-0.01497	-0.00840**	-0.03563**	-0.11724***	-0.21322***	-0.27215***
Crises	-0.00727**	-0.02193	-0.12148***	-0.04697	0.09256	-0.01004*	0.00739	-0.02925	0.02873	0.27693***
Firm_fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2 (%)	5.43	5.33	7.84	4.29	6.86	8.20	4.33	5.30	5.06	10.04
N	464	464	464	464	464	737	737	737	737	735

Table 9: PE sales: buy-and-hold market-adjusted returns *(BHAR)*

The dependent variable is the buy-and-hold market adjusted returns *(BHAR)* for 0, 30, 90, 180 and 360 days following the disclosure of PE firms' sales. *Syndicated* is a dummy variable coded one in case of a syndicated PE investment, and zero otherwise. *PE_rep* is a dummy variable coded one if the PE firm is among top 10 UK most reputable PE firms (according to Jelic, 2011) and zero otherwise. *PE_holdings* are remaining shareholdings of (all) PE firms after the sale. *UW_rep* is a dummy variable coded one if the lead underwriter belongs to the top 10 underwriters (based on Migliorati & Vismara, 2014), and zero otherwise. *Complete* is a dummy variable coded one in case of a complete PE firm sale, and zero otherwise. *Complete*First* is an interaction variable coded one in cases when sales result in a complete PE firm's exit, and zero otherwise. *T_PE_size* is size of PE sales as a percentage of firms' market capitalization. *L_PE_exp_bef is* a dummy variable for transactions that took place before PEs' lock up expiry date. All other variables are same controls used in Tables 6, 7 and 8. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

	Market-adjusted returns of holding the individual position *(BHAR)*				
	***BHAR*$_0$**	***BHAR*$_{30}$**	***BHAR*$_{90}$**	***BHAR*$_{180}$**	***BHAR*$_{360}$**
Constant	-0.00329	-0.05892	0.21187*	0.29861	0.53719
Syndicated	-0.00375	-0.02680	-0.03965	-0.00518	0.10587
PE_rep	-0.00709	0.05303**	0.00078	-0.00785	-0.18669
PE_holdings	-0.00036*	0.00043	0.00188	-0.00077	-0.00444
UW_rep	-0.00054	-0.00279	-0.00855	-0.02033*	-0.02749*
Complete	-0.00029	0.00716	0.07862	-0.03564	-0.14997
Complete_First	-0.01040	-0.06003	-0.05965	-0.02260	-0.05573
T_PE_size	0.00014	0.00077	-0.00141	-0.00505	-0.00845
L_PE_exp_bef	-0.00324	-0.05291*	-0.12383**	-0.18094**	-0.00755
Crises	0.00069	-0.06849**	-0.08587*	-0.13965	-0.18214
Firm_fixed	Yes	Yes	Yes	Yes	Yes
Adj_R^2 (%)	5.00	18.79	17.08	12.17	10.43
N	219	219	219	219	219

Figure 1: Sub-periods before and after lockup expiry

This figure exhibits the generation of sub-samples based on three periods around the lockup expiry date: (i) Sub-sample 1: all transactions between one day after the IPO date until one day before the lockup (LU) expiry date (period 1), (ii) sub-sample 2: all transactions from lockup expiry (LU) date until the last day before one year after the LU date (period 2), (ii) sub-sample 3: all transactions from one year after the lockup expiry (LU) date until the last day before two years after the LU date (period 3).

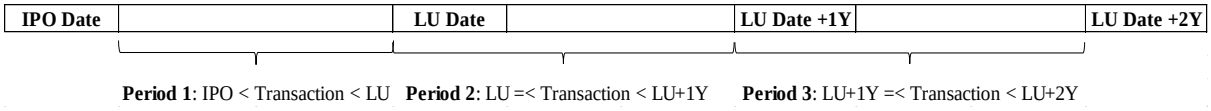


Figure 2: Quarterly distribution of directors' purchases

This figure provides the distribution of directors' purchases between the IPO date and two years after the lockup expiry (LU) date. Q-1 (Q-2) represents the first (second) quarter before and Q1 (Q2) the first (second) quarter after the LU date, respectively. Thus, Q1 to Q4 comprise the first year after the LU date, and Q5 to Q8 comprise the second year after the LU expiry date.

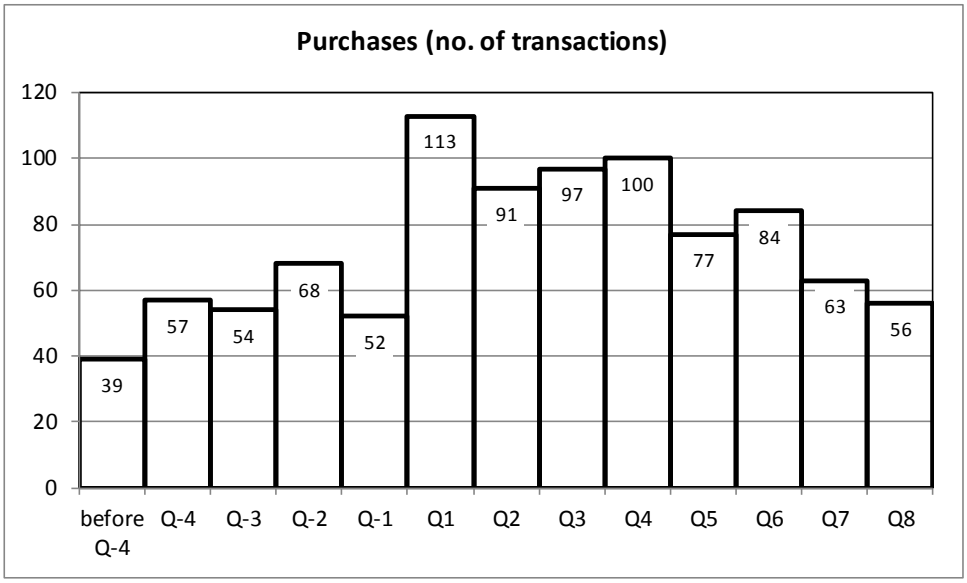


Figure 3: Quarterly distribution of directors' sales

This figure provides the distribution of directors' sales between the IPO date and two years after the lockup expiry (LU) date. Q-1 (Q-2) represents the first (second) quarter before and Q1 (Q2) the first (second) quarter after the LU date, respectively. Thus, Q1 to Q4 comprise the first year after the LU date, and Q5 to Q8 comprise the second year after the LU expiry date.

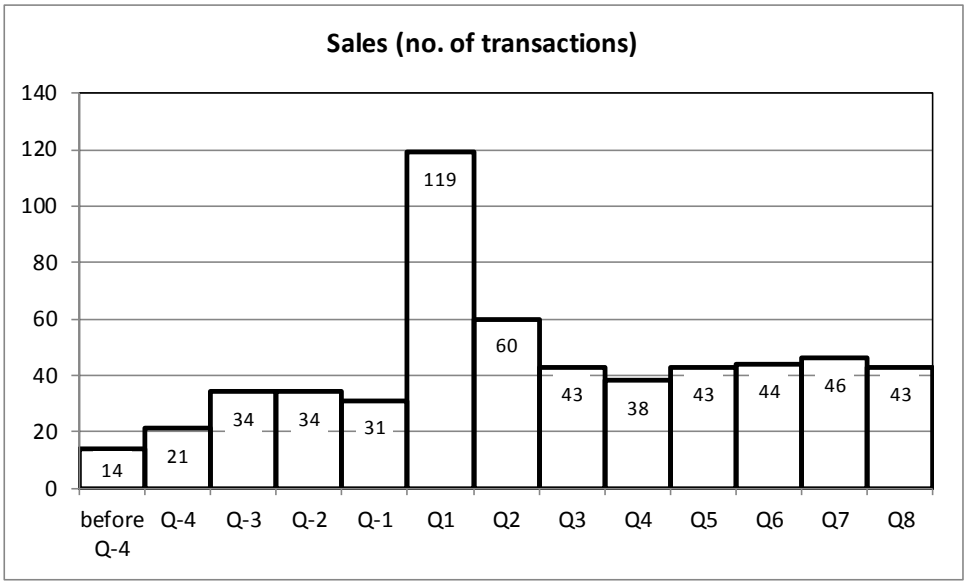


Figure 4: Quarterly distribution of PE firms' sales

This figure provides the distribution of PE firms' sales between the IPO date and two years after the lockup expiry (LU) date. Q-1 (Q-2) represents the first (second) quarter before and Q1 (Q2) the first (second) quarter after the LU date, respectively. Thus, Q1 to Q4 comprise the first year after the LU date, and Q5 to Q8 comprise the second year after the LU expiry date.

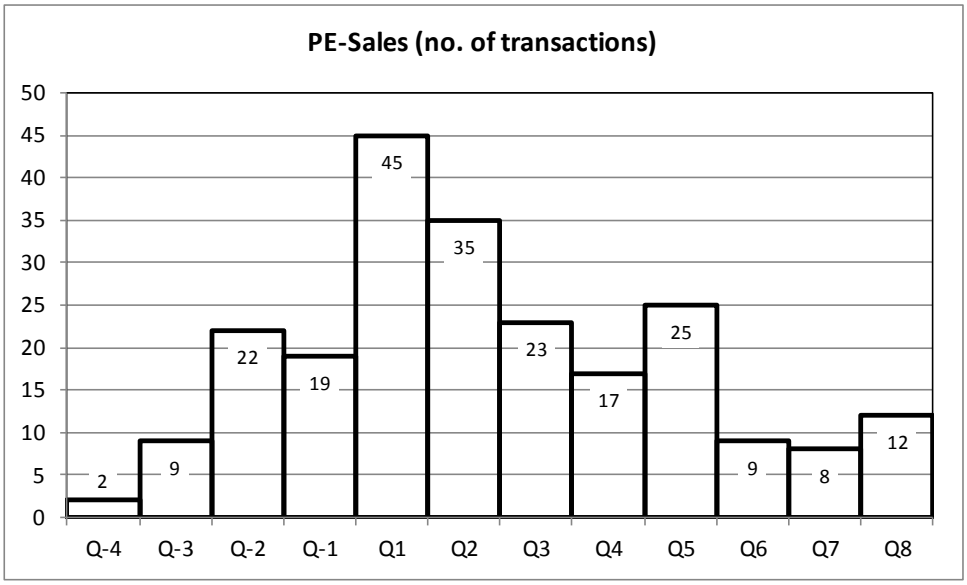


Figure 5: Insider transactions per calendar year

Number of directors' purchases and sales as well as PE firm sales in each calendar year during the entire insider transaction sample period (January 1999 to December 2017).

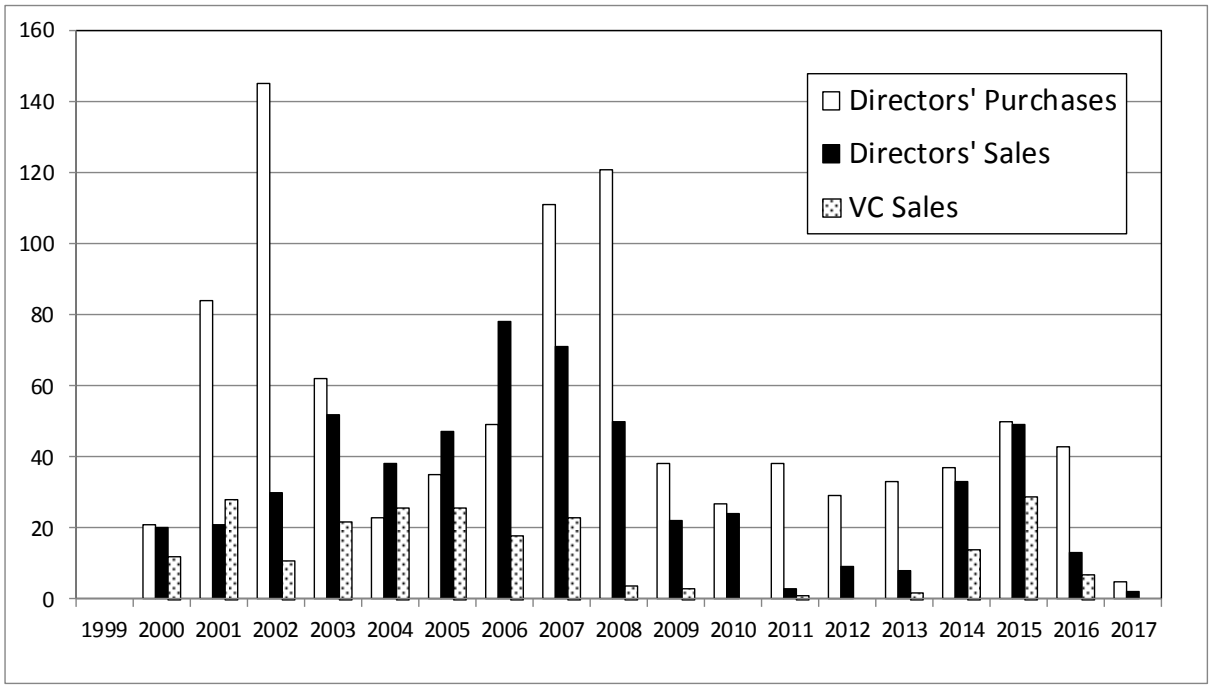
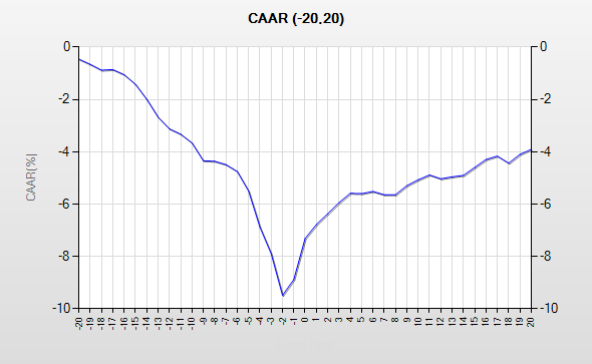


Figure 6: Directors' trades

Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date). Abnormal returns are calculated based on market model adjusted expected returns.

Purchases (N=932)



Sales (N=567)

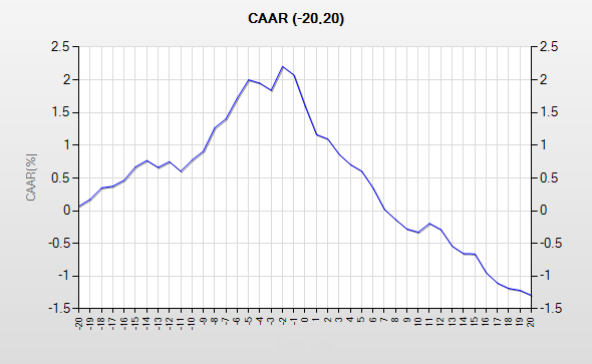


Figure 7: PE firms' sales

Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date). Abnormal returns are calculated based on market model adjusted expected returns.

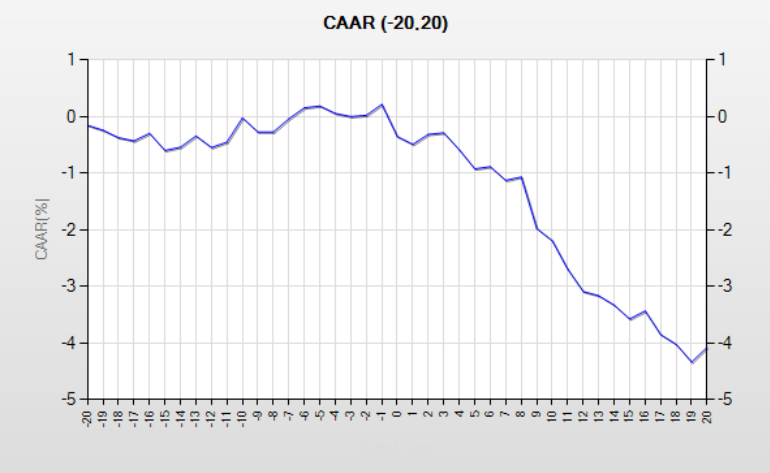
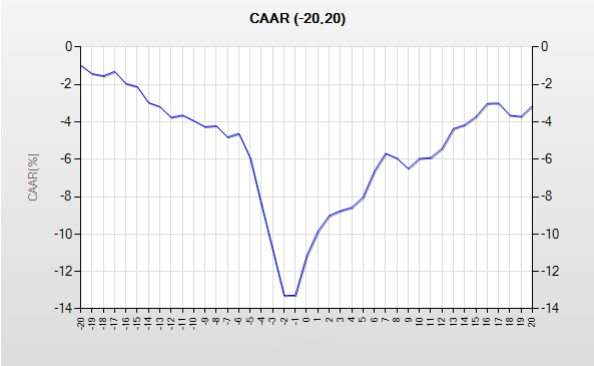


Figure 8: Trades by different types of directors

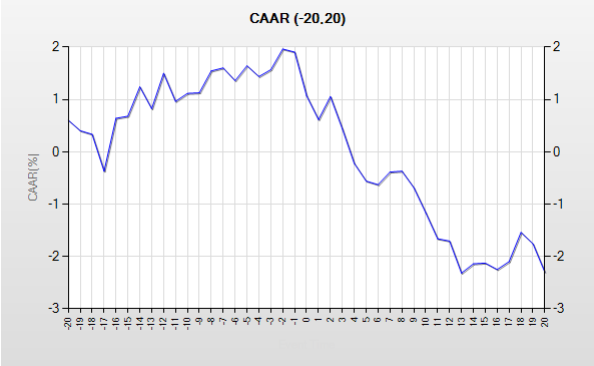
Cumulative average abnormal returns (CAR) in percent during the 41-day event window (-20 to +20 trading days around the announcement date) for the total period (IPO date < transaction < two years after lockup expiry date). Abnormal returns are calculated based on market model adjusted expected returns. *Panel A* presents CARs for CEOs at the purchase or sale transaction, *Panel B* for CFOs at the purchase or sale transaction, *Panel C* for Chairpersons at the purchase or sale transaction, *Panel D* for Independent directors, *Panel E* for Former directors, and *Panel F* for PDMR.

Panel A: CEOs

Purchases (N=81)

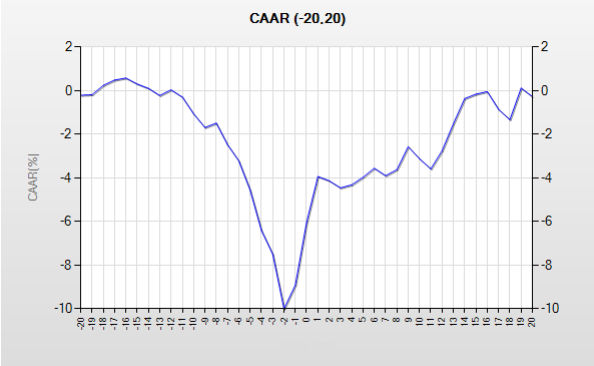


Sales (N=49)

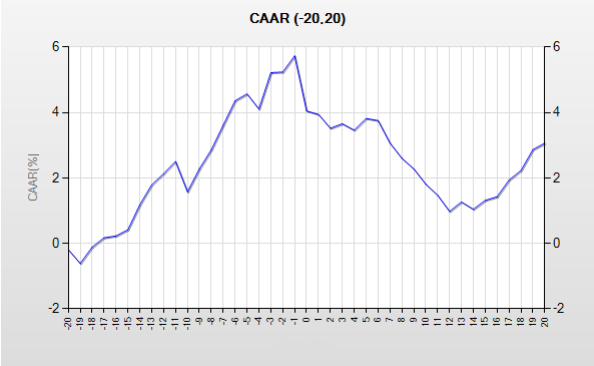


Panel B: CFOs

Purchases (N=38)

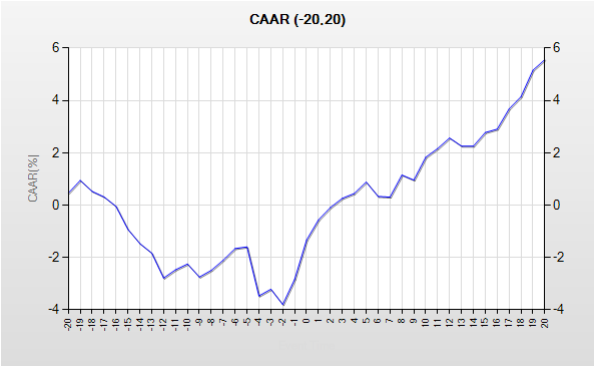


Sales (N=16)

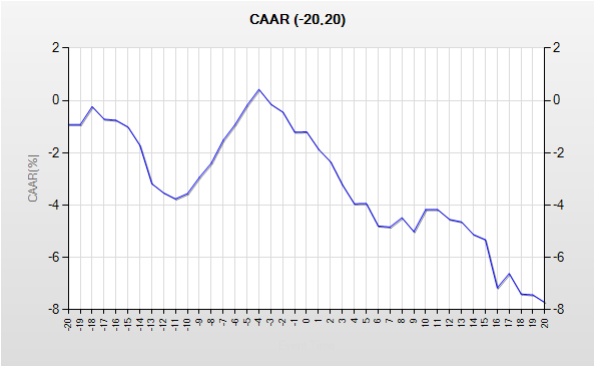


Panel C: Chairperson

Purchases (N=101)

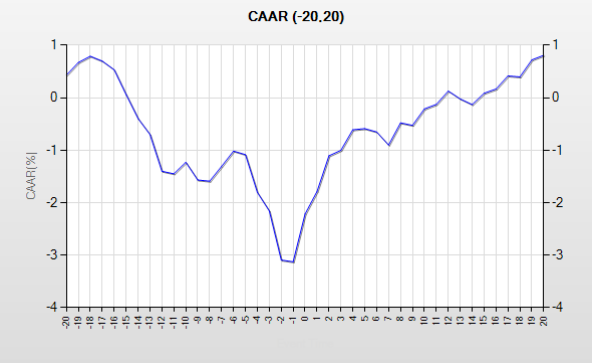


Sales (N=27)

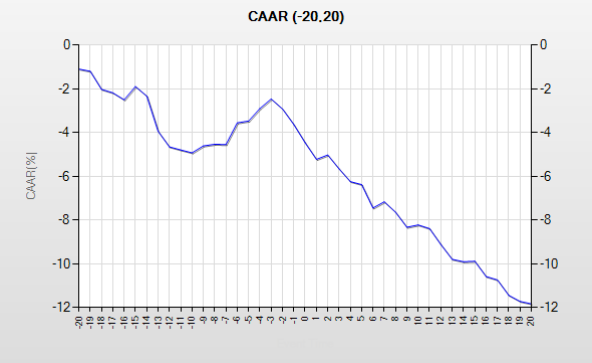


Panel D: Independent directors

Purchases (N=297)

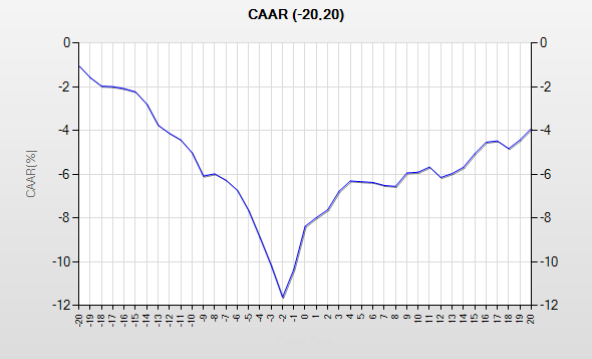


Sales (N=32)

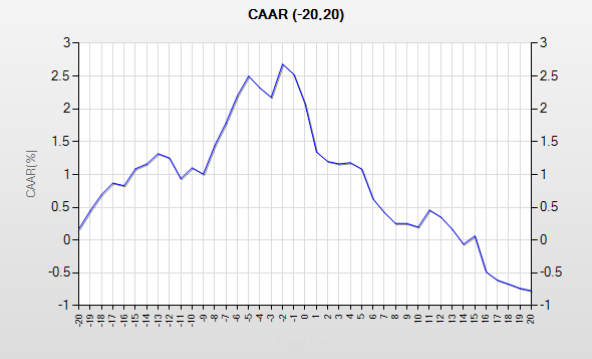


Panel E: Former directors

Purchases (N=409)

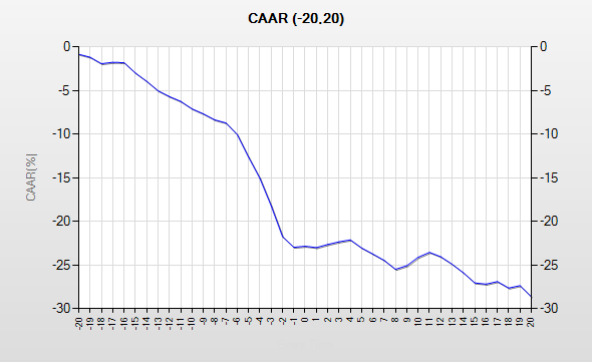


Sales (N=258)



Panel F: PDMRs

Purchases (N=76)



Sales (N=195)