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Flying below the radar: Insider trading by executives below the top☆

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ABSTRACT

To enforce insider trading laws, financial regulators require top executives to make their own-company trades public. One implication of this regulatory focus is that executives below the top fly under the radar. We use administrative register data from Norway to examine whether executives below the top in listed companies earn abnormal returns on purchases in own-company stock. We find evidence of abnormal returns on such trades, about 50 to 100 basis points at the 1-month horizon. The abnormal returns on purchases in other stocks are negative, making high investor ability an unlikely explanation.

Insider trading threatens public confidence in financial markets and is regulated across the world (e.g., Bhattacharya and Daouk, 2002). A centerpiece of these regulations is that primary insiders, that is, top executives and board members, are required to publicly disclose their purchases and sales. Little is known about whether the threshold is set "right", or whether a wider group of employees has access to and trade on non-public, material, information. Our study examines whether executives below the top, who are just below the threshold to be considered primary insiders, have access to and trade on non-public, material information.

Whether executives below the top make abnormal returns on their inside trades is an open empirical question. On one hand, the closeness of below-the-top executives to the top of the corporate hierarchy makes it plausible that they have access to inside information.[1] For example, a

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[1] Material information could be obtained in several ways. It might arise from regular work tasks, interactions with co-workers (Hvide and Östberg, 2015), or as a by-product of attempts to gauge future wage prospects (Van Nieuwerburgh and Veldkamp, 2006, 2010). Consistent with material information being available to employees, Green, Huang, Wen, and Zhou (2019); Huang, Li, and Markov (2020); and Sheng (2021) show that online feedback from employees at glassdoor.com is informative about the company's stock price. Babenko and Sen (2016) show that annual participation rates in employee stock programs are informative about future stock prices, while Lee, Lui and Zhu (2008) show that employees tend to overweight own-company stocks in their equity portfolio. In comparison, our study is the first to use transaction data to test whether executives below the top trade on the basis of material information.

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compliance officer at UBS recently received a three-year sentence for insider trading,[2] and >50 individuals—*a* third of the top executives and managers—in the illegal trading networks studied by Ahern (2017) were mid-level managers. On the other hand, executives below the top might purchase own-company stocks for reasons other than inside information, such as familiarity with the stock, loyalty, or signaling of commitment to the company. Executives below the top might also trade own-company stocks because they are overconfident or have a false sense of having access to material information (Benartzi, 2001; Døskeland and Hvide, 2011). These other reasons for trading are not likely to induce positive abnormal returns. Our study provides the first systematic evidence on the extent to which below-the-top executives trade on inside information.

We use administrative register data from Norway that cover the population of trades by individual investors from 1997 to 2014. Employer-employee data identify each investor's employer and which position inside the firm that individual occupies. The positional codes, provided by Statistics Norway, are designed in a way that demarcates below-the-top executives as a separate category. Our transaction data include open market transactions as well as stock awards allocated by the employer. We focus on open market transactions because they derive from investors active decisions to trade, and thus eliminate transactions that are likely to be stock awards from our main sample (details are provided in Section 2). Our main sample includes around 82,000 purchases and 62,000 sales worth 23.5 billion Norwegian kroner (€3.2 billion). These trades are tilted towards own-company stocks with around 21,700 purchases (26 %) in own-company stocks and 60,500 purchases (74 %) in other stocks.

To test whether executives below the top trade on material information, we analyze whether their purchases in own-company stock earn abnormal returns.[3] To rule out high investor ability, we also compare the abnormal returns on inside purchases to the abnormal returns on other trades made by the same individuals, including purchases of non-inside stocks. For ease of exposition, we refer to trading in own-company stocks as "inside trading."[4]

Following the recommendations of Lyon et al. (1999), we test for abnormal returns on inside purchases made by below-the-top executives using two different methods. First, we use a control-firm approach as in Barber and Lyon (1997) and Døskeland and Hvide (2011). This method compares actual returns on inside purchases with the distribution of returns for hypothetical purchases in stocks with similar market size, book-to-market, and prior returns characteristics. Second, we use a calendar-time portfolio approach accommodating risk factors according to the Carhart (1997) four-factor model.[5] In further tests, we follow Cohn et al. (2024) and use the distribution of pre-event returns to accommodate the possibility that standard errors in the calendar-time portfolio approach are inflated due to insider trading being correlated across firms.

Below-the-top executives make economically and statistically significant abnormal returns on purchases in own-company stocks. For example, we find an abnormal return on the 1-month horizon equal to 68 basis points using the control-firm approach, and 101 basis points using the calendar-time portfolio approach. On longer horizons the abnormal returns are even larger. For example, the abnormal return on inside purchases is about 250 basis points on the 6-month horizon. The finding that abnormal returns are increasing over time suggest that executives below the top do not exclusively trade on short-term information.

To supplement the main analysis of trades made by executives below the top in their personal brokerage accounts, we analyze trades made via majority-owned limited liability companies (LLCs) and trades made in the brokerage account of close family members. Both types of "indirect" trades occur infrequently and are not associated with abnormal returns. This suggest that indirect trades are not motivated by inside information and that executives below the top use their personal brokerage accounts trade when making trades based on material information.

It is possible that executives below the top have special stock-picking abilities and thus make abnormal returns on *all* their purchases. However, they do not earn abnormal returns on non-inside purchases. For example, the abnormal return on the 1-month horizon equals minus 94 basis points for the control-firm approach for non-inside purchases, and minus 116 basis points for the calendar-time portfolio approach. This effectively rules out that executives below the top have special abilities that allow them to earn abnormal returns on all investments.

Possibly, executives below the top have intimate industry knowledge that allow them to make abnormal returns on all stock investments within their industry. However, we show that they do not earn abnormal returns on purchases in same-industry stocks other than the own-company stocks. Across most specifications, abnormal returns on purchases in same-industry stocks are negative and statistically significant, suggesting that industry knowledge is not the driver behind abnormal returns on inside purchases of executives below the top

Another possible explanation for why executives below the top make abnormal returns could be that they get access to price-sensitive information faster than market participants. For instance, executives below the top could have access to information about customer feedback or worker satisfaction (Green, Huang, Wen and Zhou, 2019; Huang, Li and Markov, 2020; and Sheng, 2021). To the extent that this information is not yet public, this would be an example of trading on the basis of material inside information. If this information is public, but executives react faster, then they earn abnormal returns on the basis of public information. In relation to this possibility, we note that the calendar-time portfolio approach uses end-of-month stock prices to calculate abnormal returns. Thus, it seems implausible that abnormal returns from the calendar-time portfolio approach are driven by reacting faster to information that has become public.

Does access to material information and willingness to trade on it extend to (non-executive) employees? To address this question, we use the positional codes provided by Statistics Norway to analyze the returns to inside purchases by (non-executive) employees. We find evidence of abnormal positive returns, but less so than for executives below the top. For employees, the abnormal returns are similar across the wage distribution, but higher-paid employees have higher trading intensity than lower-paid employees. In additional tests, we analyze the abnormal returns to inside trades by top executives. Alphas for insider trades by top executives are generally positive but smaller than for executives below the top, and statistically insignificant in most specifications. These findings suggest that top executives are more careful than executives below the top when trading own company stocks.

Our estimates from Norway likely reflect a lower bound of the extent to which executives below the top benefit from insider trading around the world. Norway was among the first developed countries to introduce

[2] See, e.g., https://www.complianceweek.com/europe/ubs-compliance-officer-convicted-of-insider-trading/27334.article

[3] Early studies find that insider purchases and sales both contain predictive information about future returns (e.g., see Jaffe, 1974; Seyhun, 1986). More recent work finds that only insider purchases contain positive information about future stock returns, since sales are more likely made for liquidity or diversification reasons (e.g., Lakonishok and Lee, 2001; Jeng, Metrick, and Zeckhauser, 2003; Jagolinzer, Larcker, and Taylor, 2011; Jiang, Wintoki, and Xi, 2021).

[4] We refer to purchases and sells of own-company stocks as "inside buys" and "inside sells," respectively. Similarly, we refer to purchases and sells of other company stocks as "non-inside buys" and "non-inside sells."

[5] As discussed in Appendix A, these methodologies are used in recent studies of abnormal returns by corporate insiders (Biggerstaff, Cicero, and Wintoki, 2020 ; and Cziraki, Lyandres and Michaely, 2021) and by politicians (Belmont et al., 2020; and Huang and Xuan, 2023).

insider trading laws, in 1985.[6] Also, Norway consistently ranks high on transparency and governance indices: it ranks 8th out of 190 on the World Bank ease-of-doing-business index, and it ranks among the 10 least-corrupt countries in the world, according to the Corruption Perception Index published by Transparency International. Moreover, in studies by Eckbo and Smith (1998) and Eckbo and Ødegaard (2020) on the returns to publicly reported insider trading on Oslo Stock Exchange, neither study finds evidence of abnormal returns for such trades.

Insider trading erodes public confidence in financial markets resulting in lower stock market participation (DeMarzo, Fisman, and Hagerty, 1998; Guiso, Sapienza, and Zingales, 2008; Giannetti and Wang, 2016; Gurun, Stoffman, and Yonker, 2018) and higher cost of equity (Bhattacharya and Daouk 2002; Easley and O'Hara, 2004).[7] Regulators have a number of levers in place to detect and deter insider trading, perhaps the most important being the mandatory reporting of trades by primary insiders.[8] A vast literature exploits the data generated by mandatory reporting by primary insiders and finds some evidence of abnormal returns to such reported trades.[9] Evidence has not been available on the trading behavior and returns of individuals that are not covered by mandatory reporting. Berkman, Koch, and Westerholm (2014) finds that underaged brokerage accounts perform exceedingly well. Although suggestive of insider trading, their study does not connect the underage accounts to company insiders, due to data limitations. Our study provides the first direct evidence on inside trading by individuals who are "just below" the threshold to be considered primary insiders.

Our second contribution is methodological. Prior literature analyzes returns to insider trading of top executives using publicly announced trades of own-company stocks. Positive abnormal returns are interpreted as evidence of insider trading based on material, non-public information. However, top executives are highly able individuals, who might perform well in financial markets even in the absence of inside information. We exploit the richness of the administrative register data and evaluate whether executives below the top also earn abnormal returns on non-inside trades. We find no such evidence, which suggests that abnormal returns on inside purchases cannot be explained by a general ability to pick stocks. In further tests, we compare trades in own-company stocks to trades in other stocks in the same industry. We find no evidence of abnormal returns for trades in other stocks in the same industry, suggesting that industry-specific knowledge does not drive our main results. Our study is the first to use these individual-specific benchmarks to rule out general stock-picking ability or industry-specific knowledge as explanations for the abnormal returns to insider trading.

Our study proceeds as follows. In Section 1, we outline the institutional details on insider trading. Section 2 presents our data and provides descriptive statistics. In Section 3, we introduce the methodology for testing abnormal returns, while Section 4 reports the main results focusing on trades in personal brokerage accounts, as well as additional tests focusing on trades in limited liability companies or trades by close family members. In Section 5, we show the results of several additional tests, including the abnormal returns to same-industry non-inside stocks. We also examine abnormal returns to insider trading across the corporate hierarchy for employees (i.e., non-executives) and for top executives, as well as for below-the-top executives before they are externally hired or promoted to the executive position. Section 6 concludes. The Internet Appendix provides additional tests.

1. Insider trading: legal and theoretical backdrop

Trading based on inside information is illegal in all developed markets. In markets like the EU, Norway, and the United States, the legal definition of insider trading is trading in securities based on material, non-public information. "Material information" means information that is relevant for investors' demand for the securities, and thus for security prices. Note that the insider trading definition applies to *anyone* who trades based on material, non-public information; *inside* does not refer to the relationship between the investor and the company.

To monitor the trading by corporate insiders (who are most likely to have access to material, non-public information), additional regulation requires officers, directors, and large shareholders to report their transactions in own-company stocks to the authorities. For instance, in the United States, corporate officers, directors, and significant shareholders are required to file a Form 4 with the Securities and Exchange Commission before the end of the second business day following a trade involving own-company stocks. Many jurisdictions (e.g., the EU and Norway) require companies to keep a list of primary insiders (e.g., managers or directors who have access to inside information).[10] The primary insiders are required to report their trades in the company to market participants within a short period after the trade took place. To supplement the legal framework, firms can voluntarily adopt insider trading policies (ITP) to limit the trading of executives to specific periods.[11] Insider trading based on material, non-public information is illegal–with or without voluntary ITPs. Engaging in such trading is thus a trade-off between the gains from abnormal returns and the cost of potentially being caught.[12]

Norway follows the example of the EU and defines a primary insider as a person who is a member of the top management team, member of the board of directors, or an external auditor. Each listed company is responsible for identifying and providing an up-to-date list of its primary

[6] Bhattacharya and Daouk (2002) describe the evolution of insider trading laws around the world. The passage of insider trading laws in the United States in 1934 was followed by the adoption of insider trading laws in Canada in 1966, France in 1967, Sweden in 1971, Singapore in 1973, the United Kingdom in 1980, and Norway in 1985. Stricter second-generation regulations were introduced in Norway in 1992.

[7] Other studies argue that allowing insider trading can make prices in financial markets more informative (e.g., Leland, 1992; Cornell and Sirri, 1992).

[8] Other levers include flagging of trades around corporate events such as earnings and merger announcements, whistleblower programs (including financial incentives), short-swing rules, and black-out periods.

[9] The abnormal returns are mainly driven by insider purchases rather than by inside sales (e.g., Lakonishok and Lee, 2001; Jeng, Metrick, and Zeckhauser, 2003; Fidrmuc, Goergen, and Renneboog, 2006; Ravina and Sapienza, 2010; and Biggerstaff, Cicero, and Wintoki, 2020. Exceptions are the findings of zero abnormal returns for inside trades by Jenter (2005) in the United States and by Eckbo and Smith (1998) and Eckbo and Ødegaard (2020) in Norway. Abnormal returns are larger around "opportunistic trades" (Cohen, Malloy, and Pomorski, 2012; Ali and Hirshleifer, 2017), merger announcements (Keown and Pinkerton, 1981), and in "black-out" periods (Bettis, Coles, and Lemmon, 2000; Jagolinzer, Larcker, and Taylor, 2011).

[10] Norway introduced the primary insider list in the Securities Trading Act (*Lov om Verdipapirhandel*) of 1997. The Securities Trading Act has been revised in 2007 and 2021 to align the law with the EU Market Abuse Directive (MAD) of 2003 and the EU Market Abuse Regulation (MAR) of 2014, respectively.

[11] Our searches of media and annual reports found little evidence to suggest that ITPs are frequently used in Norway. Jagolinzer, Larcker, and Taylor (2011) report that 16% of the firms in the United States have adopted ITPs.

[12] In Appendix F, we outline a theoretical model of the decision problem, in the spirit of the seminal tax evasion model of Allingham and Sandmo (1972). See also DeMarzo et al. (1998) for a model of insider trading motivated by asymmetric information.

insiders to the Oslo Stock Exchange.[13] All primary insiders are required by the Securities Trading Act to notify Oslo Stock Exchange of any transaction they carry out in financial securities (i.e., shares, equity certificates, warrants, options, bonds, etc.) issued by the company, no later than at the start of trading on the following day.[14] The notification requirement also applies to transactions carried out by a primary insider's family members, including his or her spouse, or a partner with whom they co-habit in a relationship akin to marriage, as well as underage children. Oslo Stock Exchange publishes information about the trade (i.e., the number of securities purchased or sold by the primary insider, date, and the identity of the primary insider) under the heading "Mandatory notification of trade – primary insiders" in a publicly available database (newsweb.no).

Thus, in terms of the definition and regulation of insider trading, Norway has implemented rules that are equivalent to those of the EU and the United States.[15] Requiring specific company insiders to report their trades is a practical solution that helps companies, investors, and regulators monitor trading activity by individuals who are likely to have access to inside information, but also implies that a large number of executives below the top fly under the radar. Our study provides the first evidence on the return to trades for executives below the top, who are not required to publicly announce their trades.

2. Data and descriptive statistics

2.1. Data and sample selection

Our main sample covers all purchases and sells of common stocks in personal brokerage accounts in Norway from 1997 to 2014, in addition to economic and personal information about individuals, as well as stock characteristics. The data are from three sources. Records of transactions (buy and sells) are from the Norwegian Central Securities Depository (*Verdipapirsentralen*), which keeps records of all stock transactions on Oslo Stock Exchange. The transaction data include purchases based on the exercise of stock options, but do not allow us to identify whether a given inside purchase results from exercise of stock options or not. Neither do the data flag shares awarded by the firm to the employees, an issue we return to below.

For each transaction made by an individual, the data include date, the International Securities Identification Number (ISIN) of the security, the number of shares transferred to or from the individual, and the individual's (anonymized) personal identification number, which is equivalent to the social security number in the United States. For individuals who made several purchases of the same stock on the same day, we aggregate the purchases to the individual-stock-date level. We do the same for sells. As the transaction data do not include transaction prices, we use the closing price on the trading day as the transaction price. This ensures that our returns do not pick up differences between exercise (purchase) prices and market prices when exercising stock options or warrants (employee stock programs). Daily stock prices and company information such as market capitalization are from the Oslo Stock Exchange (OSE). For industry classification, we use NACE codes, which is the standard industrial classification system in the European Union.

We obtain individual demographics from Statistics Norway. These data include age, gender, education, and income. We further use matched employer-employee data which contain the ID of the employer and the occupation of the individual (i.e., the position inside the firm). The matched employer-employee data have been used extensively by labor economists (e.g., Kirkeboen, Leuven, and Mogstad, 2016). The matched employer-employee data classify positions based on the International Standard Classification of Occupations (ISCO-88), which is a system prepared by the International Labor Organization. Positions are classified using 3- or 4-digit codes, providing a detailed breakdown of job categories. To preserve anonymity, Statistics Norway provides us with an anonymized version of the data in which all personal identification numbers are substituted with a unique personal ID. Collectively, these data make it possible to identify own-company stock trades (and other-company stock trades) between 1997 and 2014.

The starting point of our analysis is the use of the ISCO-88 classification codes of the employer-employee data to identify executives below the top.[16] In ISCO-88, corporate managers have classification 12. This group is split into three different subgroups: 121 ("Directors and Chief Executive Officers"), 122 ("Production and Operations department managers") and 123 ("Other department managers"). In the executives below the top category, we include 122 and 123. We define as "employees" all ISCO-88 codes in which the first two digits are not 12.[17] We then merge the employer-employee data with the trading data to identify insider trades and non-insider trades.

We are interested in analyzing the returns to regular, open-market, purchases by executives below the top in own-company stocks. Our hypothesis is that such purchases are associated with abnormal returns. A threat to identification is that many companies in the sample period use stock awards as a means of employee compensation.[18] These programs leave individual employees no discretion on the number of shares involved in the transaction, nor on which dates they are awarded (other programs leave some discretion on the timing of the transaction and on the quantity of shares, and involve a substantial subsidy from the firm). Transactions that are part of stock award programs are not flagged in the data. There is no reason to think that these transactions are associated with abnormal returns. The measurement error caused by such programs will therefore tend to bias our estimates of abnormal returns toward zero.

This measurement error problem is particularly pertinent for two large oil companies, Norsk Hydro and Statoil, merging in 2007 to form StatoilHydro and changing name to Statoil in 2009, and later to Equinor. These two companies constitute about a third of the market capitalization of Oslo Stock Exchange and were both pioneers in using stock award

[13] Oslo Stock Exchange maintains a list of primary insiders for all listed companies on its website:
https://live.euronext.com/en/markets/oslo/primary-insiders. As an example of how this rule works in practice, consider Orkla ASA (ticker: ORK), a large cap food conglomerate. As of January 2021, Orkla maintains a list of 36 primary insiders, which include 15 company officers (CEO, other top executives, and their advisory team), 18 board members (members and substitutes), and 3 external auditors. Similarly, Nordic Semiconductor ASA, a small cap producer of wireless internet equipment, has 11 managers, 11 board members, and 1 external auditor on its list of primary insiders.

[14] The Ministry of Justice and Public Security of Norway provides an English translation of the Securities Trading Act (*Lov om verdipapirhandel*) on the website lovdata.no:
https://lovdata.no/dokument/NLE/lov/2007-06-29-75

[15] One difference between the EU and United States is the short-swing profit rule introduced by the SEC in 1934, which requires company insiders to return any profits made from the purchase and sale of company stock if both transactions occur within a six-month period. See White (2020) for a discussion of the short-swing rule in the context of the United States.

[16] The data provide us with the "Standard for Yrkesklassifisering",which is the Norwegian version of ISCO-88. See https://www.ilo.org/public/english/bureau/stat/isco/isco88/major.htm for the detailed ISCO-88 classification. We use the first three digits of the "Standard for Yrkesklassifisering," which have exact correspondence to those of the ISCO-88.

[17] We classify individuals in ISCO-88 category 131 ("General managers") as employees because, according to the ISCO-88 documentation, they head "various small business undertakings" and, thus, are far away from the top of the corporate hierarchy. In unreported analysis, we find no evidence of this category making abnormal returns, consistent with this group not trading based on material information.

[18] Similar programs are common in many countries. See e.g., Bergman & Jenter (2007) for evidence from the US.

programs as a means of remuneration in the early 2000. Moreover, both companies have a highly skilled workforce and a relatively high fraction of employees with executive titles; many are engineers with senior responsibilities in drilling. Ideally, we would discard all transactions that result from stock award programs and focus exclusively on open-market purchases. This route is impractical; while some stock compensation programs are well documented in the press or in the annual reports (as those of Hydro and Statoil) this is not generally the case.[19]

We choose a conservative approach to deal with stock award programs. We start out by identifying dates when many employees and executives in the same company have *identical* buy transactions of own-company stock. For example, on January 13, 2012, 887 employees and executives in Sparebank SR-Bank increased their holdings of own-company stock by 10 shares each. The chance that 887 individuals simultaneously decided to make a regular, open-market purchase of the exact same quantity of shares appears vanishingly small. We then eliminate all company-days where at least 500 employees or executives make the exact same buy transaction. This eliminates 145 out of about 70,000 (about 0.2 %) of company-days in the sample.[20] In Appendix Tables E1 and E2, we show that the excluded buy transactions (i.e., made on company-dates with at least 500 identical own-company buy transactions) yield a negative but close to zero abnormal returns, consistent with these transactions being uninformative about future returns. The same holds if we choose different cutoffs, varying from 100 to 500 identical buy transactions, as also shown in Appendix Tables E1 and E2, respectively.

In Appendix Tables E3 and E4, we analyze abnormal returns for inside purchases if we set other cutoffs between 100 and 500. For the control firm analysis, the results are similar across the cutoffs. For the calendar-time portfolio approach, the estimated coefficients are positive across all cutoffs but tend to lose statistical significance as we move the cutoff from 500 towards 100.

Finally, to ensure that our results are not driven by tiny trades we omit trades with a market value of less than NOK 1000. In Appendix D, we show that the results are very similar if we do not exclude tiny trades or choose a threshold of NOK 5000, 10,000 or 50,000.[21]

2.2. Summary statistics on insider trading activity

Table 1 provides descriptive statistics on the trading activity of executives below the top who are active in the stock market, i.e., have purchased or sold a stock at some point during the sample period. Individual characteristics of the executives are reported in Appendix Table B1. The average executive in our sample, 79 % of whom are male, is 47.5 years old and earns about 1.15 million NOK (equivalent to 143,800 euros).[22]

Panel A of Table 1 shows the trading activity for inside trades (i.e., own-company trades), non-inside trades and all trades (i.e., inside and non-inside trades), respectively. Executives below the top make around 82,200 purchases, of which >21,700 are purchases of own-company stocks. On the sell side, the executives below the top make >62,400 transactions, with 14,000 being in own-company stock and 48,400 being in other-company stocks. The total trade value of transactions made by executives below the top is NOK 23.5 bn. (2.9 bn. euro), of which NOK 8.5 bn. are trades in own-company stock and NOK 15.0 bn. are trades in other companies.

Table 1
Descriptive statistics by trade type.
This table provides descriptive statistics for our sample of executives below the top trading stocks on Oslo Stock Exchange between 1997 and 2014. We report descriptive statistics for inside trades (i.e., trades in own-company stock), non-inside trades (i.e., trades of other company stocks), and all trades. In Panel A, we report the following measures of trading activity: the number of (unique) firms and number of (unique) executives below the top, total number of trades, the total value of trades, the average trade value, and the median trade value. In Panel B, we report the average number of trades (i.e., buys and sells) per executive per year, and the average trade value per year. All amounts are in year-2014 Norwegian kroner (NOK). One euro equals 8 NOK during the sample period.

	Trade type		
	Inside	Non-inside	All
A. Trading activity by executives below the top			
Number of firms	222	431	439
Number of executives below the top	9976	5079	11,800
Total number of trades			
Buy	21,711	60,483	82,194
Sell	14,043	48,407	62,450
All	35,754	108,890	144,644
Total trade value (million NOK)			
Buy	3310.1	7587.0	10,897.1
Sell	5144.6	7455.3	12,599.9
All	8454.7	15,043.3	23,498.0
Average trade value (1000 NOK)			
Buy	152.5	125.5	132.6
Sell	366.4	154.0	201.8
All	236.5	138.2	162.5
Median trade value (1000 NOK)			
Buy	24.4	42.8	36.6
Sell	61.0	56.2	57.2
All	34.3	48.5	45.0
B. Trading intensity of the average executive below the top			
Number of trades per year			
Buy	0.44	0.20	0.64
Sell	0.22	0.13	0.35
All	0.67	0.34	1.01
Annual trade value (1000 NOK)			
Buy	140.1	321.2	461.4
Sell	217.8	315.6	533.4
All	357.9	636.9	994.8

Executives below the top make on average one transaction per year, of which 0.67 are inside trades and 0.34 are non-inside trades. In terms of trading volume, the average annual trading value per executive is NOK 140,100 for inside purchases and 217,800 for inside sells conditional on trading.

2.3. Summary statistics on trading returns

To examine the returns that executives earn on trading stocks, Table 2 reports the average buy and hold return over horizons from 1 week to 6 months. Panel A of Table 2 reports buy and hold returns for all buys and sells by executives. Buys are on average associated with positive returns ranging from −5 basis points in the first week to 386 basis points on the 6-month horizon. Stock prices also tend to increase after sells. The return to stocks that executives sell increases from −2 basis points in the first week to 282 basis points after 6 months. Panels B and C split the trades into two types: Panel B reports returns to insider trades (i.e., trades by executives in own-company stocks), while Panel C reports returns to non-inside trades (i.e., trades by executives in other stocks).

Across panels B and C of Table 2, we notice interesting differences in returns. Panel B shows large positive returns on inside purchases by executives below the top. Stock prices increase by 156 basis points in the

[19] An added complication is that details of these programs change over time within companies.

[20] It eliminates 145 of 6,692 (2.1%) of company-days in the sample where at least one executive is making an inside purchase. Not surprisingly, the list is dominated by Hydro and Statoil.

[21] During our sample period, all employees of listed companies may purchase company stock at a tax discount. The difference between market value and the purchase price will be taxed, but with a tax discount of 20%, subject to a cap at around 1,500 NOK (200 euros). Thus, purchases of company stocks for up to 7,500 NOK per year (1,000 euros) could be motivated by tax incentives.

[22] All amounts are in year 2014 Norwegian kroner (NOK). One euro equals 8 NOK during our sample period.

Table 2
Average returns to trading by executives below the top.
This table reports average buy-and-hold returns in percent following buys and sells of stocks by executives below the top over horizons from 1 week (5 trading days) to 6 months (6 times 21 trading days). Panel A reports average buy-and-hold returns for all trades by executives below the top. Panel B reports buy-and-hold returns for inside trades (i.e., trades in own-company stock). Panel C reports buy-and-hold returns for non-inside trades . Panel D reports buy-and-hold returns for same-industry non-inside trades based on 1-digit NACE industry codes. Panel E reports buy-and-hold returns for stock awards programs. The unit of observation is a trade.

	Horizon								
	1 week	2 weeks	3 weeks	1 month	2 months	3 months	4 months	6 months	N
A. All trades									
Buys	−0.0005	0.0009	0.0035	0.0042	0.0120	0.0226	0.0283	0.0386	82,194
Sells	−0.0002	0.0013	0.0025	0.0048	0.0107	0.0183	0.0217	0.0282	62,450
B. Inside trades									
Buys	−0.0001	0.0041	0.0118	0.0156	0.0307	0.0529	0.0691	0.0907	21,711
Sells	0.0011	0.0037	0.0051	0.0084	0.0173	0.0290	0.0365	0.0426	14,043
C. Non-inside trades									
Buys	−0.0006	−0.0002	0.0005	0.0001	0.0053	0.0118	0.0137	0.0201	60,483
Sells	−0.0006	0.0006	0.0018	0.0038	0.0088	0.0152	0.0174	0.0240	48,407
D. Same-industry non-inside trades									
Buys	−0.0033	−0.0057	−0.0062	−0.0092	−0.0061	0.0002	−0.0034	0.0004	8887
Sells	−0.0021	−0.0024	−0.0011	0.0002	0.0064	0.0138	0.0124	0.0173	7152
E. Stock award programs									
Buys	0.0015	0.0044	0.0017	0.0031	0.0064	0.0132	0.0179	0.0241	197,985

first month, and reach 907 basis points after 6 months. Stock prices also increase after inside sells, reaching 84 and 426 basis points after 1 month and 6 months, respectively. Across the horizon of buy-and-hold returns, we notice that the stock prices increase more for inside buys than for inside sells. In contrast, Panel C shows little difference in returns following buys and sells of non-inside stocks. In fact, returns are higher after non-inside sells than after non-inside buys, except at the 1-week horizon. One potential explanation for the positive difference in buy and sell return for inside stocks compared to non-inside stocks is that executives might possess industry knowledge. To address this possibility, we report the return to same-industry (non-inside) trades in Panel D, where industry is defined at the 1-digit level. Although the raw returns are generally higher for same-industry trades than for all non-inside trades in Panel C, we note that the difference between the same-industry buys and sells is smaller than for inside trades. Finally, Panel E shows that stock awards programs are associated with positive, albeit small, returns, reaching 31 and 241 basis points after 1 month and 6 months, respectively.

In summary, Table 2 provides evidence that is consistent with executives benefiting from material information when they trade own-company's stock. Table 2 suggests that executives profit from inside trades but that this result is not due to an intrinsic stock-picking ability (Panel C) or industry-specific knowledge (Panel D). Appendix Table B2 further reports returns prior to trading. We note that the prior returns are positive for both buys and sells, but the returns on buys are lower than on sells. The differences between buy and sell returns are present for inside trades, non-inside trades, and same-industry non-inside trades, but slightly stronger for inside trades.

Fig. 1 plots the average returns for various types of trades over holding horizons from 1 week to 6 months. Inside buys for executives have the highest returns, substantially larger than returns to inside sells. This result contrasts with trades in other stocks, where non-inside sells have higher buy-and-hold returns than non-inside buys. Fig. 2 narrows non-inside trades down to stocks in the same industry as their own-company stock. Fig. 2 shows that executives do not do well when they trade other stocks in the same industry.

Taken together, Figs. 1 and 2 show that executives do very well when they trade their own-company stock. The large difference in returns motivates a more careful analysis of the return to insider trading for executives below the top. In the next section, we discuss the empirical methodologies we use to draw statistical inferences.

3. Methodology

If inside trading by executives below the top is driven by non-public material information, we would expect those investments to generate positive abnormal returns. On the other hand, if inside trading stems from familiarity with the stock, loyalty, or signaling of commitment to the company, such investments would likely not earn abnormal returns. Two methodological issues arise when testing whether inside trades are associated with abnormal returns. First, when calculating test statistics, we need to compare the returns of inside trades against an appropriate benchmark. Second, cross-sectional dependence in portfolio returns across trades makes distributional properties of test statistics difficult to evaluate; test statistics that assume independence in returns across individual portfolios will produce excessive t-statistics and thus cannot be employed.[23]

To construct valid test statistics for abnormal returns, we follow the recommendations of Lyon, Barber, and Tsai (1999) and employ two different approaches, a control-firm approach and the calendar-time portfolio approach. Both methods provide appropriate benchmarks and test statistics take into account cross-sectional dependence. In keeping with prior insider trading literature, our main focus is on analyzing abnormal returns on purchases, because purchases occur more frequently and are a precondition for sales. We supplement the analysis of abnormal returns of purchases with analysis of abnormal returns on sales and long-short portfolios.

Several recent studies on whether individuals make abnormal returns based on inside information use the same two methodologies, as discussed in Appendix A. In Appendix A we also follow Cohn et al. (2024) and use the distribution of pre-event returns to accommodate the possibility that standard errors in the calendar-time portfolio approach are inflated due to insider trading being correlated across firms. Accommodating such cross-sectional dependence does not alter our main results.

3.1. Control-firm approach

To capture the abnormal return that investors earn on short-term pieces of information, we use a variant of the control-firm approach

[23] Cross-sectional dependence occurs for three reasons: 1) the same individual may make trades whose return horizons overlap; 2) more than one executive in a firm may trade at the same time; and 3) returns of stocks are positively correlated (and executives across firms may trade at the same time).

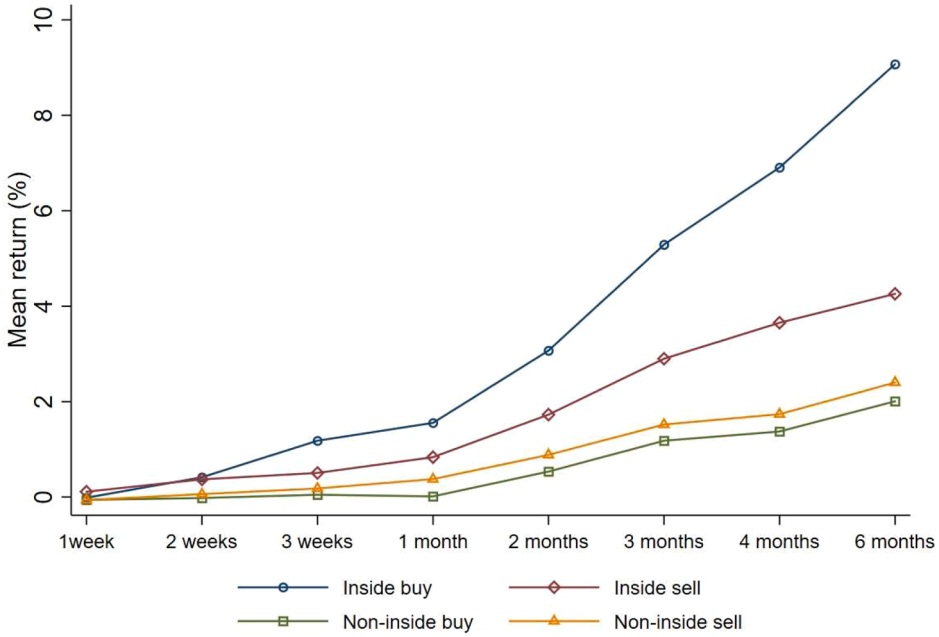


Fig. 1. Return to trading by executives below the top.
This Figure. reports the average return to trading by executives below the top. We report the average buy-and-hold return following inside buys, inside sells, non-inside buys, and non-inside sells over horizons from 1 week to 6 months.

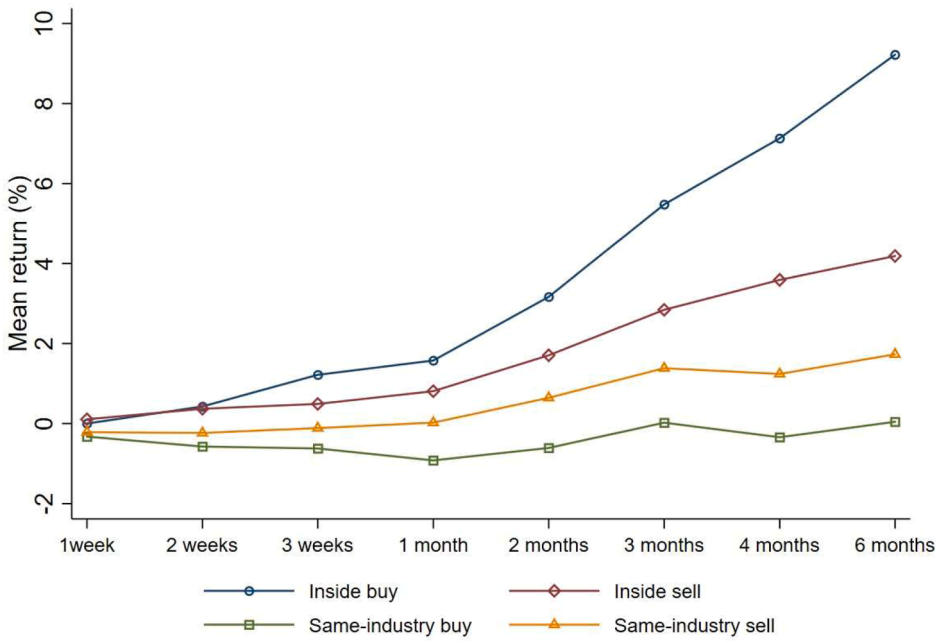


Fig. 2. Return to trading by executives below the top in same-industry.
This Figure. reports the average return to trading by executives below the top. We report the average buy-and-hold return following inside buys, inside sells, same-industry (non-inside) buys, and same-industry (non-inside) sells over horizons from 1 week to 6 months.

analyzed by Barber and Lyon (1997). This method allows us to test for abnormal returns of inside buys against three different benchmarks, using a bootstrapped empirical distribution to address cross-sectional dependence in stock returns.

As a first step, we test whether inside buys yield an abnormal return relative to the return that would have been earned by investing in a different but similar stock. While the returns for inside buys are given by the data (see Fig. 1), we construct the distribution of returns for "fictitious" buys in the following way. For each year, we start out by ranking all companies according to their market values at the end of the previous year. Within each size quartile, we split the companies into quartiles according to their market-to-book values evaluated at the end of the previous year. Within each of these 16 categories, following Lee (1997), we split companies into above and below median prior 1-year return.

For each inside buy, we randomly draw (with replacement) a stock from the same size, market-to-book, and prior return category, and evaluate the returns of the fictitious trade. Calculating the average returns on fictitious trades across investors yields one observation for the bootstrapped return distribution. We repeat this procedure 1000 times. To test for abnormal returns of inside buys, we compare the actual inside buy return with the bootstrapped return distribution for fictitious buys (this test is recommended in Lyon, Barber, and Tsai, 1999, listed as Alternative C on page 175). The null hypothesis posits that the returns of inside buys equal the mean return of the bootstrapped distribution for fictitious buys. Under a two-sided test with α confidence level, and under the assumption that the return distributions of the actual buys and the fictitious buys are the same, the null hypothesis is rejected if the actual returns are less than the α/2 percentile of the bootstrapped return distribution or higher than the (1-α/2) percentile of the bootstrapped return distribution. Abnormal returns for inside sells are computed in a similar manner.

We use a similar procedure to test for abnormal returns of inside buys against other benchmarks, i.e., the long-short portfolios. First, consider inside sell returns as a benchmark. Under the null hypothesis, the returns of inside buys are the same as the returns of inside sells. We test whether inside buys have abnormal returns compared to inside sells by first computing the inside buy minus the inside sell returns. We then create one observation of the bootstrapped return distribution by drawing one fictitious buy and one fictitious sell. The fictitious buy (sell) is drawn from the same size, market-to-book, and prior return category as the actual buy (sell). Calculating the difference in returns for the fictitious buy and the fictitious sell yields one observation for the bootstrapped return distribution. We repeat this procedure 1000 times. Under the null hypothesis, the returns of inside buys equal the returns of inside sells. Under a two-sided test with α confidence level, and under the assumption that the return distributions of the actual trades and the fictitious trades are the same, the null hypothesis is rejected if the actual difference in returns between buys and sells are less than the α/2 percentile of the bootstrapped return distribution (i.e., fictitious buy returns minus fictitious sell returns) or higher than the (1-α/2) percentile of the bootstrapped return distribution. The procedure for testing whether inside buys have abnormal returns compared to non-inside buys is the same.

3.2. Calendar-time portfolio approach

To capture returns on longer horizons, we use the calendar-time portfolio approach. This approach eliminates the problem of cross-sectional dependence in returns by bundling trades into aggregate portfolios. In the main specification, we form four portfolios based on whether a position is an inside or non-inside trade and whether the trade is a buy or sell.

To form the inside buy portfolio, we aggregate all inside buys by an individual within a month into one position. We then calculate the return of the inside buy portfolio in a given month by computing the average return across all inside buy positions. In the same manner, we form and calculate returns for the other portfolios.

To control for market movements, we use the Carhart (1997) four-factor model and include market, size, book-to-market, and momentum factors. In the main specification, we use regression weights that are proportional to the number of individual stock positions in a portfolio in a given month. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for 6 consecutive months. For brevity, we report alphas in the main tables and refer to Appendix Table B3 for details about the factor loadings.

A critique of all methods that test for long-run abnormal returns, including the calendar-time portfolio approach, is their lack of power (e.g., Kothari and Warner, 2007; Nekrasov, Shroff, and Singh, 2009). One reason for the limited power of the calendar-time portfolio approach, in its standard implementation, is that different time periods have equal weights even if they contain a different number of observations (see Loughran and Ritter, 2000). By construction, our main specification ensures that time periods with more trading activity (more executives trading) will be given more weight than periods with less trading activity (fewer executives trading). To supplement the main analysis, we present results with alternative weights in Appendix C.

4. Returns to insider trading by executives below the top

4.1. Trades in personal brokerage accounts

Do executives below the top make abnormally high returns on their inside trades? Table 3 reports the average abnormal return in basis points for horizons of 1 week to 6 months following buys and sells, using the control-firm approach. For each row, we report the difference between actual returns and the mean returns for the fictitious trades. Panel A of Table 3 reports the average abnormal return to buys. Inside buys are associated with positive abnormal returns, increasing from 30 basis points at the 2-week horizon to 68 basis points at the 1-month horizon. There are no abnormal returns on the 1-week horizon, which suggests that executives are not trading on very short-term pieces of information. In comparison, the abnormal return to the non-inside buys is minus 27 basis points at the 1-week horizon and minus 94 basis points at the 1-month horizon. The abnormal returns are statistically significant at conventional levels across all horizons (except at the 1-week horizon) for both inside buys and non-inside buys.

Panel B of Table 3 computes the abnormal returns to inside sells. We find negative and statistically significant abnormal returns, increasing from minus 22 basis points at the 1-week horizon to minus 38 basis points at the 1-month horizon. The abnormal returns for non-inside sells increase from minus 38 basis points at the 1-week horizon to minus 84 basis points at the 1-month horizon.

In Panel C, we report long-short portfolio alphas on the return to inside buys minus inside sells, inside buys minus non-inside buys, and the difference between buys and sells for inside and non-inside trades. Consistent with the evidence in panels A and B, the abnormal returns on the long-short portfolios are positive. The magnitudes are large; for example, the long-short portfolio that is long in inside buys and short in non-inside buys earns 160 basis points on the 1-month horizon. The results in Table 3 also emphasize that the executives below the top do not exclusively rely on pieces of short-term information as they continue to accumulate returns over extended horizons.

Panel A of Table 4 reports abnormal returns for buys using the calendar-time portfolio approach. We note that the alpha on inside buys is positive at all horizons. The alpha is economically and statistically significant at the 1-month horizon: executives earn an abnormal return of 101 basis points in the first month, which increases to 246 basis points (= 6 times 41 basis points) after six months. For non-inside buys, we find negative and statistically significant alphas across all horizons, increasing from minus 116 basis points at the 1-month horizon to minus 486 basis points (= 6 times minus 81 basis points) at the 6-month horizon.

Panel B of Table 4 provides estimates of abnormal returns to inside sell and non-inside sells. Alphas on inside sells are statistically insignificant at all horizons while on non-inside sells they are negative and statistically significant at all horizons.

Panel C of Table 4 reports various long-short portfolio alphas, as in Panel C of Table 3. The alphas for the long-short portfolios that is long in inside buys and short in inside sells are positive and statistically significant for all horizons. In terms of magnitude, the abnormal returns are driven by inside buys: Of the 123 basis points abnormal return on the long-short portfolio, 101 basis points can be attributed to the inside buy portfolio as shown in Panel A. For the long-short portfolio that is long in inside buys and short in non-inside buys, the alphas are positive and

Table 3
Control-firm analysis of returns to insider trading by executives below the top.
This table reports results using the control-firm approach for horizons of 1 week (5 trading days) to 6 month (6 times 21 trading days) following buys and sells by executives below the top. For each row, we report the difference between actual returns and the mean returns for the fictitious trades. The fictitious trades are from the same size, market-to-book category, and prior 1-year return category. Using the bootstrapped empirical distribution for the returns of fictitious trades, the null hypothesis of zero difference in returns can be rejected with the *p*-values that are reported in brackets. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, using a two-sided test.

	Horizon							
	1 week	2 weeks	3 weeks	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on buys								
Inside buy	−0.0001	0.0030***	0.0067***	0.0068***	0.0070***	0.0193***	0.0269***	0.0281***
	[0.541]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-inside buy	−0.0027***	−0.0042***	−0.0057***	−0.0094***	−0.0145***	−0.0202***	−0.0260***	−0.0369***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Panel B. Portfolio alphas on sells								
Inside sell	−0.0022***	−0.0026***	−0.0039***	−0.0038***	−0.0088***	−0.0109***	−0.0148***	−0.0265***
	[0.000]	[0.012]	[0.002]	[0.006]	[0.000]	[0.000]	[0.000]	[0.000]
Non-inside sell	−0.0038***	−0.0053***	−0.0065***	−0.0084***	−0.0157***	−0.0225***	−0.0283***	−0.0408***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Panel C. Long-short portfolio alphas								
Inside buy – Inside sell	−0.0014	0.0003	0.0066***	0.0072***	0.0132***	0.0240***	0.0327***	0.0483***
	[0.114]	[0.788]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Inside buy – Non-inside buy	0.0001	0.0040***	0.0110***	0.0160***	0.0265***	0.0439***	0.0586***	0.0728***
	[0.974]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
(Inside buy – Inside sell)	−0.0016	0.0009	0.0081***	0.0112***	0.0173***	0.0285***	0.0377***	0.0517***
(Non-inside buy – Non-inside sell)	[0.110]	[0.512]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Table 4
Calendar-time estimates of returns to insider trading by executives below the top.
This table reports results from the calendar-time portfolio approach. For each calendar month t, we calculate the 1-month abnormal return on four portfolios: inside buy, inside sell, non-inside buy, and non-inside sell. To control for market movements, we use the Carhart (1997) four-factor model and include the market, size, book-to-market, and momentum factors. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for the next 6 months. The unit of observation is at the monthly level, and each observation is weighted by the number of executives trading in that month. Panels A and B report alphas for buys and sells, respectively. Panel C reports alphas for long-short portfolios. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, respectively.

	Horizon				
	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on buys					
Inside buy	0.0101***	0.0105***	0.0081***	0.0063***	0.0041**
	(0.0030)	(0.0025)	(0.0022)	(0.0021)	(0.0020)
Non-inside buy	−0.0116***	−0.0104***	−0.0100***	−0.0087***	−0.0081***
	(0.0028)	(0.0027)	(0.0025)	(0.0025)	(0.0024)
Panel B. Portfolio alphas on sells					
Inside sell	0.0012	−0.0001	−0.0008	−0.0015	−0.0018
	(0.0024)	(0.0021)	(0.0020)	(0.0019)	(0.0018)
Non-inside sell	−0.0079***	−0.0085***	−0.0080***	−0.0073***	−0.0074***
	(0.0027)	(0.0024)	(0.0023)	(0.0023)	(0.0023)
Panel C. Long-short portfolio alphas					
Inside buy – Inside sell	0.0123***	0.0133***	0.0120***	0.0099***	0.0071***
	(0.0036)	(0.0028)	(0.0025)	(0.0025)	(0.0023)
Inside buy – Non-inside buy	0.0130***	0.0145***	0.0136***	0.0113***	0.0092***
	(0.0034)	(0.0030)	(0.0029)	(0.0027)	(0.0027)
(Inside buy – Inside sell)	0.0145***	0.0151***	0.0143***	0.0110***	0.0079***
(Non-inside buy – Non-inside sell)	(0.0037)	(0.0029)	(0.0027)	(0.0025)	(0.0026)

statistically significant across all horizons. The magnitudes are increasing from 130 basis points at the 1-month horizon to 552 basis points (= 6 times 92 basis points) at the 6-month horizon. Thus, executives earn positive abnormal returns for inside buys relative to non-inside buys.

Appendix C shows results using alternative specifications in the calendar-time portfolio approach. Appendix Table C1 aggregates trades to the monthly level using the market value of trades to obtain a value weighted portfolio return, and then weight each month according to the number of executives trading in that month (as in the main specification). Appendix Table C2 classifies trades into inside buys and inside sells based on the net purchases at the firm level in each month. Across these alternative specifications, we obtain results that are quantitatively similar to the main analysis.

In Appendix tables C3 and C4, we split firms into small stocks and large stocks based on market capitalization (in unreported tests, we have used quartiles rather than below/above median, and the results are similar). The results are similar to in the main analysis but, as expected, with less statistical significance. Our ability to explore links between other firm characteristics and abnormal returns for inside purchases is limited by the fact that Oslo Stock Exchange does not have too many stocks.

In summary, we find evidence of positive abnormal returns for inside purchases using both the control-firm approach and the calendar-time

Table 5
Calendar-time estimates of returns to trades in LLCs and trades by family members.
This table reports results from the calendar-time portfolio approach for trades in majority owned limited liability companies (LLC) and trades by close family members (spouse, children and parents) of executive below the top. The sample is restricted to trades from 2003 to 2014 due to limited availability of ownership data and family data. For each calendar month *t*, we calculate the 1-month excess return on two portfolios: inside buy and inside sell. To control for market movements, we use the Carhart (1997) four-factor model and include the market, size, book-to-market, and momentum factors. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for the next 6 months. The unit of observation is at the monthly level, and each observation is weighted by the number of companies or family members trading in that month. Panels A and B report alphas for inside buys and inside sells, respectively. Panel C reports alphas for the long-short portfolios. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, respectively.

	Horizon				
	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on inside buys					
Limited liability companies	−0.0148**	−0.0065	−0.0085*	−0.0035	−0.0031
	(0.0071)	(0.0052)	(0.0047)	(0.0054)	(0.0046)
Family members	−0.0052*	−0.0015	−0.0012	−0.0005	−0.0007
	(0.0028)	(0.0027)	(0.0024)	(0.0023)	(0.0021)
Panel B. Portfolio alphas on inside sells					
Limited liability companies	−0.0061	−0.0077	−0.0071	−0.0030	−0.0039
	(0.0085)	(0.0065)	(0.0059)	(0.0063)	(0.0058)
Family members	−0.0062*	−0.0044*	−0.0028	−0.0033	−0.0032
	(0.0033)	(0.0026)	(0.0024)	(0.0022)	(0.0021)
Panel C. Long-short portfolio alphas on inside buys minus inside sells					
Limited liability companies	−0.0170*	0.0000	−0.0042	0.0043	0.0054
	(0.0099)	(0.0086)	(0.0079)	(0.0082)	(0.0079)
Family members	0.0032	0.0044	0.0021	0.0029	0.0032
	(0.0039)	(0.0031)	(0.0027)	(0.0023)	(0.0020)

portfolio approach. The estimates are economically significant: about 50 to 100 basis points at the 1-month horizon.[24] Alphas on long-short portfolios that are long in inside buys and short in inside sells are economically and statistically significant on all horizons. Collectively, these findings suggest that executives below the top trade on non-public material information when making inside trades, that fly under the radar of regulators and market participants.

4.2. Trades via majority owned LLCs and trades by family members

Our main analysis focuses on trades by executives below the top in personal brokerage accounts. This analysis excludes trades that are de-facto done by the executives, but de-jure done via intermediaries. To get a more comprehensive overview of inside trading by executives below the top, we now extend the analysis to trades done via limited liability companies or by family members.[25]

If such "indirect" trades are motivated by inside information, we would expect to find positive alphas. On the other hand, if such trades are motivated by other reasons, we would not expect to find positive alphas.

4.2.1. Trades in limited liability companies

To identify inside trades made via limited liability companies we rely on ownership data on limited liability companies from 2003 to 2014. We identify all firms where an executive below the top and his/her spouse has >50 % ownership in total. A total of 605 executives below the top own a limited liability company (LLC) of which 125 make at least one stock purchase or sell between 2003 and 2014. Among the LLCs owned by executives below the top we identify around 500 inside trades (235 inside buys and 261 inside sells) and around 5500 non-inside trades (3000 non-inside buys and 2500 non-inside sells). Thus, the number of inside trades via LLCs is small relative to the 28,700 inside trades in personal brokerage accounts by executives below the top from 2003 to 2014.

Table 5 shows results from the calendar-time portfolio approach, while Appendix Table B4 shows results from the control firm approach. For both inside purchases and inside sells, we find negative, and generally statistically insignificant alphas. For the long-short portfolios in Panel C we note that alphas tend to be close to zero and statistically insignificant, except for the one month horizon where alpha is negative and statistically significant for the portfolio that is long in inside purchases and short in inside sells. For the control firm approach in Appendix Table B4, we find insignificant alphas across the board. We conclude that there is little evidence that trades in own company stocks via LLCs are associated with positive abnormal returns.

Adding the indirect trades made via LLCs to the direct trades made via personal brokerage accounts we still obtain positive and statistically significant abnormal returns for inside purchases. These results are reported in Appendix Table B5 for the calendar-time portfolio approach and Appendix Table B6 for control firm analysis.[26]

4.2.2. Trades by family members

To identify trades made by close family members, we first identify spouses, parents and children of the executives below the top. We then identify trades by these individuals from 2003 to 2014 and classify them into "inside" and "non-inside" as if these trades were made by the executive below the top. We exclude trades by family members that work for a public company from the sample to ensure that the "non-inside" trade category is not contaminated by trades motivated by inside information resulting from the family member being an "insider" at another firm. In total, we identify 3784 close family members of executives below the top that make at least one stock purchase or sell

[24] To evaluate the dollar profits, one needs to take into account the frequency and market value of their trading. During our sample period, we identify close to 10,000 executives below the top who trade own-company stock. As shown in Table 1, their trading volume for inside purchases equals >3.3 billion NOK (414 million euro). Inside buys are on average associated with a cumulative abnormal return of about 250 basis points at the six month horizon. A back-of-the-envelope calculation suggests that their abnormal profits are about 10 million euros.

[25] As ownership of LLCs is public information in Norway, it is questionable whether "hiding" insider trading through LLCs is possible. We return to this question below.

[26] Note that we only have ownership information data for 2003-2014. We therefore restrict the sample in Appendix Table B5 and B6 to trades that occur from 2003 to 2014.

between 2003 and 2014. We identify a total of close to 4700 inside trades (around 2600 inside buys and 2100 inside sells) and around 61,800 non-inside trades (around 34,200 non-inside buys and 27,600 non-inside sells) by family members of executives below the top.[27] Thus, the number of inside trades by family members is small relative to the 28,700 inside trades in personal brokerage accounts by executives below the top from 2003 to 2014.

Table 5 reports results from the calendar-time portfolio approach, while Appendix Table B4 reports results from the control firm approach. Panel A and Panel B of Table 5 show that alphas on both inside purchases and sells are negative and insignificant. The long-short portfolios have positive alphas but are statistically insignificant at all horizons. For the control firm approach in Appendix Table B4 we find positive but statistically insignificant alphas for the inside buy portfolio, and negative but statistically insignificant alphas for the inside sell portfolio, with the exception of horizons of 2 months or longer where alphas are negative and statistically significant. For the long-short portfolio we find positive but statistically insignificant alphas. Overall, we find no evidence of abnormal returns on inside trades for close family members, which suggest that these trades are not motivated by inside information.

In summary, we find little support for the idea that executives trade on inside information via limited liability companies or close family members. To provide context to these results, we note that the institutional environment in Norway is very transparent. For example, ownership of LLCs is publicly available (through e.g., proff.no), and The Norwegian Tax Administration (Skatteetaten) as well as the Financial Supervisory Authority of Norway (Finanstilsynet) have access to company trades and the identity of the LLC owners. Similarly, information on family relations can be accessed by the authorities through the National Population Register (Folkeregisteret). Thus, it is questionable whether executives below the top in Norway can conceal inside trades by trading through LLCs or through family members. Our results suggest that executives below the top prefer to trade through their personal brokerage account rather than involving family members or LLCs.

5. Do executives below the top trade on material information?

Although the evidence in Section 4 is consistent with executives below the top trading on non-public material information, other explanations are possible. One alternative explanation is that executives below the top possess detailed industry-specific or firm-specific knowledge that increases their ability to earn abnormal returns, rather than benefiting from non-public material information. We address this concern by analyzing the returns to same-industry non-inside stocks as well as returns around the event of being hired or promoted to the executive below the top position.

5.1. Industry-specific knowledge

Our baseline tests do not address the possibility that executives below the top have special industry knowledge and thus make abnormal returns on all investments in stocks within their industry. To examine this possibility, we analyze the abnormal returns to trades in stocks that are in the same industry as the own-company stock.[28] To determine whether a stock is in the same industry, we use the NACE codes, which is the standard industrial classification system in the European Union. We present results using the calendar-time portfolio approach in Table 6, and the control-firm approach in Appendix Table B7. In the main specification, we use 1-digit NACE codes. The number of purchases (sells) in same-industry stocks exceeds 8800 (7100), and the total market value of the trades is 1.28 (1.10) billion NOK. This trading activity corresponds to about 15 percent of the number of trades in non-inside stocks, and 16 percent of the trade value, as can be seen from Table 1.

While the alpha on inside buys is positive and statistically significant for all horizons in Table 6, the alphas on same-industry buys are negative and statistically significant for all horizons. For example, on the 1-month horizon, the alpha for inside buys is 101 basis points, while the alpha on the same-industry non-inside buy is minus 134 basis points. Panel B shows larger negative abnormal returns following sells of same-industry non-inside stocks, compared to sells of own-company stock. Finally, Panel C shows that the long-short portfolio alpha that is long in inside purchases and short in inside sells is positive and statistically significant for all horizons. In contrast, the corresponding same-industry non-inside long-short portfolio is negative and statistically significant. This result effectively rules out the prospect that executives have industry-specific knowledge that allows them to earn abnormal returns. The control-firm analysis, reported in Appendix Table B7, conveys a very similar message. Finally, the results on same industry trades using 2-digit classifications are very similar, as reported in Appendix tables B8 and B9.

5.2. Abnormal stock returns around job changes

To address the concern that abnormal returns of executives below the top might reflect these individuals' knowledge about the firm acquired prior to starting working there, we analyze returns for the individuals who are externally recruited as executives below the top during our sample period.[29] We follow these individuals, 991 in total, in the years around joining the new firm as executive below the top and compare the returns they make in the new firm's stock prior to and during employment. We examine three time periods: the 24 months prior to commencing in the executive position, the first 24 months in the executive position, and the next 24 months. The individuals make about 1000 inside purchases in the stock in the 24 months prior to joining, about 2600 purchases in the stock in the 24 months after joining, and about 2000 inside purchases in the next 24 months. Table 7 reports the results using the calendar-time portfolio approach, while Appendix Table B10 reports the results using the control-firm approach.

Table 7, Panel A shows positive and statistically significant alphas on inside buys in the 24 months before joining the company. At the same time, Panel B shows that alphas are positive for sells of this stock during the same period.[30] It follows from Panel C that the alphas are insignificant for the long-short portfolio on buys minus sells before hirings.

The insignificant alphas on the long-short portfolios 24 months before hirings contrast with the abnormal returns executives earn after they join the new company. In the first 24 months after hirings, executives earn positive and insignificant abnormal returns on inside buys, while the alphas for inside sells are negative and insignificant. In Panel C the alphas on the long-short portfolios are positive and statistically significant on horizons of 1, 2, 3, and 4 months. The effects after 24 months of employment appear stronger: inside buys are associated with positive and statistically significant alphas, while alphas on inside sells are negative and statistically significant for horizons up to three months. Panel C shows a positive and statistically significant alpha on all

[27] Among these family members, parents are the most active with 43% of the trades by close family members, followed by spouses (29%) and children (28%).

[28] Døskeland and Hvide (2011) analyze same-industry stock trades for individual investors in Norway, but does not include inside trades or analyze the returns of executives.

[29] It would be interesting to track the change in inside returns for individuals who move onto or off the list of primary insiders; we hypothesize that such individuals obtain lower returns after moving onto the list. However, as explained in Section 2.1, the data do not allow us to make such inferences, as the insider trading announcements identify individuals, while the transactions data are anonymized.

[30] One reason why both buys and sells are quite high in the two years before the executives join could be that firms tend to hire executives in periods of growth, where the stock market value of the firm appreciates.

Table 6
Calendar-time estimates of returns to insider trading compared to same-industry trading.
This table reports results from the calendar-time portfolio approach of same-industry trades based on the 1-digit NACE industry code. For each calendar month *t*, we calculate the 1-month excess return on four portfolios: inside buy, same-industry non-inside buy, inside sell, and same-industry non-inside sell. To control for market movements, we use the Carhart (1997) four-factor model and include the market, size, book-to-market, and momentum factors. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for the next 6 months. The unit of observation is at the monthly level, and each observation is weighted by the number of executives trading in that month. Panels A and B report alphas for buys and sells, respectively. Panel C reports alphas for long-short portfolios. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, respectively.

	Horizon				
	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on buys					
Inside buys	0.0101***	0.0105***	0.0081***	0.0063***	0.0041**
	(0.0030)	(0.0025)	(0.0022)	(0.0021)	(0.0020)
Same-industry non-inside buy	−0.0134***	−0.0126**	−0.0122***	−0.0098***	−0.0089***
	(0.0038)	(0.0034)	(0.0032)	(0.0032)	(0.0029)
Panel B. Portfolio alphas on sells					
Inside sell	0.0012	−0.0001	−0.0008	−0.0015	−0.0018
	(0.0024)	(0.0021)	(0.0020)	(0.0019)	(0.0018)
Same-industry non-inside sell	−0.0055	−0.0084**	−0.0076***	−0.0060**	−0.0069**
	(0.0036)	(0.0033)	(0.0031)	(0.0030)	(0.0029)
Panel C. Long-short portfolio alphas					
Inside buy – Inside sell	0.0123***	0.0133***	0.0120***	0.0099***	0.0071***
	(0.0036)	(0.0028)	(0.0025)	(0.0025)	(0.0023)
Same-industry non-inside buy– Same-industry non-inside sell	−0.0078*	−0.0056	−0.0085***	−0.0077***	−0.0032
	(0.0043)	(0.0036)	(0.0030)	(0.0028)	(0.0027)

horizons for the long-short portfolio. Appendix Table B10 provides evidence from the control-firm approach that are broadly consistent with the results in Table 7.

We interpret the positive alphas on inside purchases prior to hiring as firms being more likely to hire in periods when the firms perform well and their stock prices are appreciating. Consistent with this explanation, alphas are positive both for stock purchases and stock sales done before hiring (see Panel A and B of Table 7, respectively). We also note that the long-short portfolios that are long in purchases and short in sales have negative or close to zero alphas (see Panel C of Table 7). In contrast, after hirings we find that alphas are positive on inside purchases, negative for inside sales, and positive for the long-short portfolios.

We also compare the return to insider trading before and after promotion to the executive level. Again, we split into three time periods: the 24 months prior to promotion to the executive position, the first 24 months in the executive position, and the next 24 months. The individuals who are promoted, 766 in total, make about 1200 inside purchases in the 24 months prior to promotion, about 1300 inside purchases in the 24 months after promotion, and about 850 inside purchases in the next 24 months. Table 8 reports the results using the calendar-time portfolio approach, while Appendix Table B11 reports the results using the control-firm approach. The results are somewhat mixed; in the control firm approach the abnormal returns to inside buys are negative prior to promotion, somewhat positive the first two years after promotion, and positive two years after promotion. The calendar-time portfolio approach results are weaker, which may suggest that we have a power issue in this part of the analysis.

To summarize, the analysis of trading around external hirings at the executive level suggests that such events are associated with a significant improvement in the ability to generate abnormal returns from insider trading. Promotions appear to a lesser extent to lead to significant improvements in returns. We conclude that the abnormal returns for executives below the top evidenced in Section 4 are unlikely to result from industry-specific knowledge or intrinsic knowledge about the firm.

5.3. Return to insider trading across the corporate hierarchy

We now compare the abnormal returns to insider trading made by executives below the top to the abnormal returns made across the corporate hierarchy. We analyze abnormal returns on inside trades for non-executive employees and for top executives, as defined by the ISCO-88 classification in the employer-employee dataset. We further divide employees into 3 groups based on the wage distribution inside the firm focusing on employees in the 75th to 100th percentile, the 25th to 75th percentile, and below the 25th percentile.

Table 9 contains the results using the calendar-time portfolio approach, while Appendix Table B12 reports the results using the control-firm approach. Across both tables, alphas for insider trades by top executives are generally positive, but statistically insignificant in most specifications. The finding of limited abnormal returns to insider trading by top executives is consistent with findings in prior literature (e.g. Eckbo and Smith, 1998; and Eckbo and Ødegaard, 2020) and suggest that top executives are more careful than executives below the top when trading own company stocks consistent with a greater detection probability as outlined in the model in Appendix F.

In Panel A of Table 9, we find positive and statistically significant (except for the 1-month horizon) abnormal returns for employees on inside purchases, consistent with this group trading on the basis of material information. For inside sells alphas are close to zero and statistically insignificant at all horizons. For the portfolio that is long in the inside buys and short in inside sells, alphas are positive and statistically significant at horizons of 2 months and longer. The results in Appendix Table B9 are similar for inside buys, while alphas on inside sells are negative and statistically significant at all horizons. Again, alphas are positive and statistically significant at horizons of 2 months and longer for the portfolio that is long in the inside buys and short in inside sells.

As can also be seen from Table 9 and Appendix Table B9, the abnormal returns for employees are quite similar across the wage distribution. This suggests that trading on inside information is prevalent across the corporate hierarchy, and even includes employees at the bottom of the wage distribution. We note, however, that the trading intensity is significantly higher at the top of the wage distribution; employees in the 75th to 100th percentile make around 30,000 inside purchases, while employees below the 25th percentile make about 14,000 inside purchases.

We note that the abnormal returns are larger in the short term for executives below the top than for employees, especially in the control firm analysis in Appendix Table B12, while the difference is smaller on the longer horizons. The difference in returns at the short horizon suggest that executives below the top to a greater extent trade on short-term

Table 7
Calendar-time estimates of returns to insider trading around hirings.
This table reports results from the calendar-time portfolio approach around hirings for buys and sells of the stock of the new firm. For each calendar month *t*, we calculate the 1-month excess return on six portfolios: inside buy before hiring (month −24 to −1); inside buy after hiring (month 0 to 24); inside buy after hiring (month 24 to 48); inside sell before hiring (month −24 to −1); inside sell after hiring (month 0 to 24); and inside sell after hiring (month 24 to 48). To control for market movements, we use the Carhart (1997) four-factor model and include the market, size, book-to-market, and momentum factors. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for the next 6 months. The unit of observation is at the monthly level, and each observation is weighted by the number of executives trading in that month. Panels A and B report alphas for buys and sells, respectively. Panel C reports alphas for long-short portfolios. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, respectively.

	Horizon				
	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on inside buys					
Before hiring (month −24 to −1)	0.0067	0.0092**	0.0076*	0.0073**	0.0085**
	(0.0051)	(0.0044)	(0.0040)	(0.0038)	(0.0034)
After hiring (month 0 to 24)	0.0037	0.0084**	0.0037	0.0028	0.0029
	(0.0036)	(0.0036)	(0.0033)	(0.0031)	(0.0030)
After hiring (month 24 to 48)	0.0112**	0.0161***	0.0128***	0.0101**	0.0081**
	(0.0054)	(0.0052)	(0.0048)	(0.0043)	(0.0039)
Panel B. Portfolio alphas on inside sells					
Before hiring (month −24 to −1)	0.0222*	0.0035	0.0067	0.0038	−0.0032
	(0.0117)	(0.0106)	(0.0099)	(0.0097)	(0.0101)
After hiring (month 0 to 24)	−0.0140*	−0.0011	−0.0051	−0.0048	0.0020
	(0.0075)	(0.0059)	(0.0054)	(0.0056)	(0.0062)
After hiring (month 24 to 48)	−0.0188**	−0.0109*	−0.0089*	−0.0070	−0.0060
	(0.0080)	(0.0060)	(0.0052)	(0.0054)	(0.0050)
Panel C. Long-short portfolio alphas on inside buys minus inside sells					
Before hiring (month −24 to −1)	−0.0025	0.0002	−0.0103	−0.0110	0.0101
	(0.0065)	(0.0077)	(0.0086)	(0.0083)	(0.0079)
After hiring (month 0 to 24)	0.0303***	0.0195***	0.0211***	0.0191***	0.0083
	(0.0079)	(0.0067)	(0.0062)	(0.0068)	(0.0082)
After hiring (month 24 to 48)	0.0220***	0.0176**	0.0165**	0.0124**	0.0148***
	(0.0081)	(0.0075)	(0.0067)	(0.0059)	(0.0051)

Table 8
Calendar-time estimates of returns to insider trading around promotions.
This table reports results from the calendar-time portfolio approach around promotions to executive below the top. For each calendar month *t*, we calculate the 1-month excess return on six portfolios: inside buy before promotion (month −24 to −1); inside buy after promotion (month 0 to 24); inside buy after promotion (month 24 to 48); inside sell before promotion (month −24 to −1); inside sell after promotion (month 0 to 24); and inside sell after promotion (month 24 to 48). To control for market movements, we use the Carhart (1997) four-factor model and include the market, size, book-to-market, and momentum factors. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for the next 6 months. The unit of observation is at the monthly level, and each observation is weighted by the number of executives trading in that month. Panels A and B report alphas for buys and sells, respectively. Panel C reports alphas for long-short portfolios. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, respectively.

	Horizon				
	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on inside buys					
Before promotion (month −24 to −1)	0.0001	0.0128**	0.0080*	0.0088**	0.0097**
	(0.0048)	(0.0051)	(0.0046)	(0.0041)	(0.0038)
After promotion (month 0 to 24)	0.0122**	0.0139***	0.0071*	0.0032	0.0015
	(0.0047)	(0.0045)	(0.0042)	(0.0039)	(0.0039)
After promotion (month 24 to 48)	0.0083	0.0058	0.0027	0.0012	0.0023
	(0.0062)	(0.0050)	(0.0050)	(0.0047)	(0.0043)
Panel B. Portfolio alphas on inside sells					
Before promotion (month −24 to −1)	0.0099	0.0058	0.0069	0.0041	−0.0008
	(0.0076)	(0.0052)	(0.0054)	(0.0056)	(0.0053)
After promotion (month 0 to 24)	−0.0041	−0.0034	−0.0066	−0.0030	−0.0076
	(0.0076)	(0.0063)	(0.0052)	(0.0050)	(0.0046)
After promotion (month 24 to 48)	−0.0035	−0.0034	−0.0016	−0.0060	−0.0035
	(0.0071)	(0.0051)	(0.0053)	(0.0053)	(0.0053)
Panel C. Long-short portfolio alphas on inside buys minus inside sells					
Before promotion (month −24 to −1)	−0.0074	0.0091	0.0005	0.0046	0.0096*
	(0.0073)	(0.0061)	(0.0065)	(0.0059)	(0.0056)
After promotion (month 0 to 24)	0.0091	0.0147*	0.0110	0.0026	0.0037
	(0.0078)	(0.0082)	(0.0067)	(0.0066)	(0.0050)
After promotion (month 24 to 48)	0.0010	0.0033	0.0035	0.0033	0.0047
	(0.0075)	(0.0068)	(0.0071)	(0.0069)	(0.0060)

information.

Overall, we find evidence of abnormal returns for both executives below the top and for employees, but limited evidence of abnormal returns for top executives. For top executives our results are consistent with the findings in Eckbo and Ødegaard (2020) of limited abnormal returns on trades by primary insiders on Oslo Stock Exchange. In contrast, our finding of abnormal returns on inside trades for both executives below top and for employees, suggest that trades that fly under

Table 9
Calendar-time estimates of returns to insider trading across the corporate hierarchy.
This table reports results from the calendar-time portfolio approach across the corporate hierarchy (see Section 5.3 for definitions), focusing on top executives and employees. For employees we also report result across the wage distribution. For each calendar month *t*, we calculate the 1-month excess return on two portfolios: inside buy and inside sell. To control for market movements, we use the Carhart (1997) four-factor model and include the market, size, book-to-market, and momentum factors. We consider portfolio formation periods of 1, 2, 3, 4, and 6 months prior to calendar month *t*. For example, under a 6-month portfolio formation period, a given inside buy will be included in the inside buy portfolio for the next 6 months. The unit of observation is at the monthly level, and each observation is weighted by the number of top executives or employees trading in that month. Panels A and B report alphas for buys and sells, respectively. Panel C reports alphas for long-short portfolios. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % level, respectively.

	Horizon				
	1 month	2 months	3 months	4 months	6 months
Panel A. Portfolio alphas on inside buys					
Top executive	0.0028	0.0062*	0.0035	0.0024	0.0040
	(0.0034)	(0.0032)	(0.0029)	(0.0028)	(0.0027)
Employees	0.0036	0.0070**	0.0068**	0.0066***	0.0037*
	(0.0037)	(0.0031)	(0.0028)	(0.0025)	(0.0022)
Employees: wage in 75–100th percentile	0.0004	0.0040	0.0055	0.0058*	0.0033
	(0.0043)	(0.0039)	(0.0035)	(0.0031)	(0.0027)
Employees: wage in 25–75th percentile	0.0041	0.0074**	0.0068***	0.0065***	0.0037*
	(0.0036)	(0.0029)	(0.0026)	(0.0024)	(0.0021)
Employees: wage in 1–25th percentile	0.0079**	0.0114***	0.0092***	0.0082***	0.0047**
	(0.0036)	(0.0028)	(0.0025)	(0.0023)	(0.0021)
Panel B. Portfolio alphas on inside sells					
Top executive	0.0032	0.0046	0.0034	0.0021	0.0024
	(0.0035)	(0.0030)	(0.0027)	(0.0025)	(0.0025)
Employees	0.0002	−0.0007	−0.0008	−0.0014	−0.0021
	(0.0020)	(0.0018)	(0.0017)	(0.0017)	(0.0017)
Employees: wage in 75–100th percentile	−0.0004	−0.0018	−0.0015	−0.0019	−0.0026
	(0.0022)	(0.0019)	(0.0018)	(0.0018)	(0.0017)
Employees: wage in 25–75th percentile	0.0005	−0.0003	−0.0006	−0.0012	−0.0018
	(0.0020)	(0.0018)	(0.0017)	(0.0017)	(0.0017)
Employees: wage in 1–25th percentile	0.0001	−0.0004	−0.0005	−0.0010	−0.0021
	(0.0021)	(0.0020)	(0.0019)	(0.0019)	(0.0019)
Panel C. Long-short portfolio alphas on inside buys minus inside sells					
Top executive	0.0085**	0.0090**	0.0043	0.0046	0.0065**
	(0.0041)	(0.0036)	(0.0030)	(0.0031)	(0.0030)
Employees	0.0024	0.0083***	0.0098***	0.0097***	0.0075***
	(0.0040)	(0.0033)	(0.0030)	(0.0029)	(0.0026)
Employees: wage in 75–100th percentile	−0.0020	0.0060	0.0086**	0.0096***	0.0075***
	(0.0044)	(0.0040)	(0.0036)	(0.0033)	(0.0028)
Employees: wage in 25–75th percentile	0.0036	0.0090***	0.0091***	0.0096***	0.0072***
	(0.0040)	(0.0032)	(0.0030)	(0.0028)	(0.0025)
Employees: wage in 1–25th percentile	0.0056	0.0109***	0.0093***	0.0102***	0.0089***
	(0.0043)	(0.0032)	(0.0030)	(0.0030)	(0.0027)

the radar of market participants and regulators quite broadly are associated with abnormal returns.

6. Concluding remarks

We examine whether executives below the top trade on material information by analyzing abnormal returns on their purchases of own-company stocks made via their personal brokerage accounts. We find evidence of substantial abnormal returns of such "under the radar" purchases. Our study provides the first evidence of the frequency and the returns to insider trading by individuals who are "just below" the threshold to be considered primary insiders.

In further tests, we find no evidence of a general ability among executives below the top to earn abnormal returns on stocks; the abnormal returns on purchases of non-inside stocks are negative. Our study is the first to use these individual-specific benchmarks to rule out intrinsic ability or industry-specific knowledge as an explanation for abnormal returns to insider trading.

Our results from Norway, a highly regulated and transparent country, plausibly provides a lower bound of the extent to which executives below the top exploit material information in broader settings. Our results may therefore be quite informative for a wider debate about whether a larger group of company employees than top executives should be considered primary insiders.

CRediT authorship contribution statement

Hans K. Hvide: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Kasper Meisner Nielsen:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation.

Declaration of competing interest

"I have nothing to disclose."

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jfineco.2026.104282.

Data availability

Replication package for "Flying below the radar: Insider trading by executives below the top" (Reference data) (Mendeley Data)

References

Ahern, K., 2017. Information networks: evidence from illegal insider trading tips. J. Financ. Econ. 125 (1), 26–47. https://doi.org/10.1016/j.jfineco.2017.03.009.

Ali, U., Hirshleifer, D., 2017. Opportunism as a managerial trait: predicting insider trading profits and misconduct. J. Financ. Econ. 126 (3), 490–515. https://doi.org/10.1016/j.jfineco.2017.09.002.
Allingham, M.G., Sandmo, A., 1972. Income tax evasion: a theoretical analysis. J. Public Econ. 1 (3/4), 323–338. https://doi.org/10.1016/0047-2727(72)90010-2.
Babenko, I., Sen, R., 2016. Do nonexecutive employees have valuable information? Evidence from employee stock purchase plans. Manage. Sci. 62 (7), 1878–1898. https://doi.org/10.1287/mnsc.2015.2226.
Barber, B.M., Lyon, J.D., 1997. Detecting long-run abnormal stock returns: the empirical power and specification of test statistics. J. Financ. Econ. 43 (3), 341–372. https://doi.org/10.1016/S0304-405X(96)00890-2.
Belmont, W., B. Sacerdote, R. Sehgal, I.V. Hoek. 2020. Relief rally: senators as feckless as the rest of us at stock picking. NBER Working Paper no. 26975.
Biggerstaff, L., Cicero, D., Wintoki, M.B., 2020. Insider trading patterns. J. Corp. Financ. 64, 101654. https://doi.org/10.1016/j.jcorpfin.2020.101654.
Benartzi, S., 2001. Excessive extrapolation and the allocation of 401 (k) accounts to company stock. J. Financ. 56 (5), 1747–1764. https://doi.org/10.1111/0022-1082.00388.
Bergman, N.K., Jenter, D., 2007. Employee sentiment and stock option compensation. J. Financ. Econ. 84 (3), 667–712. https://doi.org/10.1016/j.jfineco.2006.01.008.
Berkman, H., Koch, P.D., Westerholm, J.P., 2014. Informed trading through the accounts of children. J. Financ. 69 (1), 363–404. https://doi.org/10.1111/jofi.12043.
Bettis, C., Coles, J.L., Lemmon, M., 2000. Corporate policies restricting trading by insiders. J. Financ. Econ. 57 (2), 191–220. https://doi.org/10.1016/S0304-405X(00)00055-6.
Bhattacharya, U., Daouk, H., 2002. The world price of insider trading. J. Financ. 57 (1), 75–108. https://doi.org/10.1111/1540-6261.00416.
Carhart, M.M., 1997. On the persistence in mutual fund performance. J. Financ. 52 (1), 57–82. https://doi.org/10.1111/j.1540-6261.1997.tb03808.x.
Cohen, L., Malloy, C., Pomorski, L., 2012. Decoding inside information. J. Financ. 67 (3), 1009–1043. https://doi.org/10.1111/j.1540-6261.2012.01740.x.
Cohn, J.B., Johnson, T., Liu, Z., Wardlaw, M., 2024. Past is prologue: inference from the cross section of returns around an event. Forthcoming in J. Financ. Econ.
Cornell, B., Sirri, E.R., 1992. The reaction of investors and stock prices to insider trading. J. Financ. 47 (3), 1031–1059. https://doi.org/10.1111/j.1540-6261.1992.tb04004.x.
Cziraki, P., Lyandres, E., Michaely, R., 2021. What do insiders know? Evidence from insider trading around share repurchases and SEOs. J. Corp. Financ. 66, 101544. https://doi.org/10.1016/j.jcorpfin.2019.101544.
DeMarzo, P.M., Fisman, M.J., Hagerty, K.M., 1998. The optimal enforcement of insider trading regulations. J. Pol. Econ. 106 (3), 602–632. https://doi.org/10.1086/250023.
Døskeland, T., Hvide, H.K., 2011. Do individual investors have asymmetric information based on work experience? J. Financ. 66 (3), 1011–1041. https://doi.org/10.1111/j.1540-6261.2011.01658.x.
Easley, D., O'Hara, M., 2004. Information and the cost of capital. J. Financ. 59 (4), 1553–1583. https://doi.org/10.1111/j.1540-6261.2004.00672.x.
Eckbo, B.E., Smith, D.C., 1998. The conditional performance of insider trades. J. Financ. 53 (2), 467–498. https://doi.org/10.1111/0022-1082.205263.
Eckbo, B.E., B.A. Ødegaard. 2020. Insider trading, risk aversion, and gender. Working paper, Dartmouth College.
Fidrmuc, J.P., Goergen, M., Renneboog, L., 2006. Insider trading, news releases and ownership concentration. J. Financ. 61 (6), 2931–2973. https://doi.org/10.1111/j.1540-6261.2006.01008.x.
Giannetti, M., Wang, T.Y., 2016. Corporate scandals and household stock market participation. J. Financ. 71 (6), 2591–2636. https://doi.org/10.1111/jofi.12399.
Green, T.C., Huang, R., Wen, Q., Zhou, D., 2019. Crowdsourced employer reviews and stock returns. J. Financ. Econ. 134 (1), 236–251. https://doi.org/10.1016/j.jfineco.2019.03.012.
Guiso, L., Sapienza, P., Zingales, L., 2008. Trusting the stock market. J. Financ. 63 (6), 2557–2600. https://doi.org/10.1111/j.1540-6261.2008.01408.x.
Gurun, U., Stoffman, N., Yonker, S.E., 2018. Trust busting: the effect of fraud on investor behavior. Rev. Financ. Stud. 31 (4), 1341–1376. https://doi.org/10.1093/rfs/hhx058.
Huang, K., Li, M., Markov, S., 2020. What do employees know? Evidence from a social media platform. Account. Rev. 95 (2), 199–226. https://doi.org/10.2308/accr-52519.
Huang, R., Y. Xuan. 2023. "Trading" political favors: evidence from the impact of the STOCK act. NBER working paper No. 34524.
Hvide, H.K., Östberg, P., 2015. Social interaction at work. J. Financ. Econ. 117 (3), 628–652. https://doi.org/10.1016/j.jfineco.2015.06.004.
Jaffe, J.F., 1974. Special information and insider trading. J. Bus. 47 (3), 410–428. https://doi.org/10.1086/295655.
Jagolinzer, A.D., Larcker, D.F., Taylor, D.J., 2011. Corporate governance and the information content of insider trades. J. Account. Res. 49 (5), 1249–1274. https://doi.org/10.1111/j.1475-679X.2011.00424.x.
Jeng, L., Metrick, A., Zeckhauser, R., 2003. Estimating the returns to insider trading: a performance-evaluation perspective. Rev. Econ. Stat. 85 (2), 453–471. https://doi.org/10.1162/003465303765299936.
Jenter, D., 2005. Market timing and managerial portfolio decisions. J. Financ. 60 (4), 1903–1949. https://doi.org/10.1111/j.1540-6261.2005.00783.x.
Jiang, C., Wintoki, M.B., Xi, Y., 2021. Insider trading and the legal expertise of corporate executives. J. Bank. Financ. 127, 106114. https://doi.org/10.1016/j.jbankfin.2021.106114.
Kirkeboen, L.J., Leuven, E., Mogstad, M., 2016. Field of study, earnings, and self-selection. Q. J. Econ. 131 (3), 1057–1111. https://doi.org/10.1093/qje/qjw019.
Keown, A.J., Pinkerton, K.M., 1981. Merger announcements and insider trading activity: an empirical investigation. J. Financ. 36 (4), 855–869. https://doi.org/10.1111/j.1540-6261.1981.tb04888.x.
Kothari, S.P., Warner, J.B., 2007. Econometrics of event studies. In: Eckbo, B.E. (Ed.), Handbook of Empirical Corporate Finance, Handbook of Empirical Corporate Finance, 1. North Holland, pp. 3–36. https://doi.org/10.1016/B978-0-444-53265-7.X5001-X.
Lakonishok, J., Lee, I., 2001. Are insiders' trades informative? Rev. Financ. Stud. 14 (1), 79–112. https://doi.org/10.1093/rfs/14.1.79.
Leland, H.E., 1992. Insider trading: should it be prohibited? J. Pol. Econ. 100 (4), 859–887. https://doi.org/10.1086/261843.
Lee, I., 1997. Do firms knowingly sell overvalued equity? J. Financ. 52 (4), 1439–1466. https://doi.org/10.1111/j.1540-6261.1997.tb01116.x.
Lee, Y.T., Liu, Y.J., Zhu, N., 2008. The costs of owning employer stocks: lessons from Taiwan. J. Financ. Quant. Anal. 43 (3), 717–740. https://doi.org/10.1017/S0022109000004269.
Loughran, T., Ritter, J., 2000. Uniformly least powerful tests of market efficiency. J. Financ. Econ. 55 (3), 361–389. https://doi.org/10.1016/S0304-405X(99)00054-9.
Lyon, J.D., Barber, B.M., Tsai, C.-L., 1999. Improved methods for tests of long-run abnormal stock returns. J. Financ. 41 (1), 165–201. https://doi.org/10.1111/0022-1082.00101.
Nekrasov, A., P. Shroff, R. Singh. 2009. Tests of long-term abnormal performance. Working paper, University of Minnesota.
Ravina, E., Sapienza, P., 2010. What do independent directors know? Evidence from their trading. Rev. Financ. Stud. 23 (3), 962–1003. https://doi.org/10.1093/rfs/hhp027.
Seyhun, H.N., 1986. Insiders' profits, costs of trading, and market efficiency. J. Financ. Econ. 16 (2), 189–212. https://doi.org/10.1016/0304-405X(86)90060-7.
Sheng, J. 2021. Asset pricing in the information age: employee expectations and stock returns. Working paper, University of California.
Van Nieuwerburgh, S., Veldkamp, L., 2006. Inside information and the own company stock puzzle. J. Eur. Econ. Assoc. 4 (2–3), 623–633. https://doi.org/10.1162/jeea.2006.4.2-3.623.
Van Nieuwerburgh, S., Veldkamp, L., 2010. Information acquisition and under-diversification. Rev. Econ. Stud. 77 (2), 779–805. https://doi.org/10.1111/j.1467-937X.2009.00583.x.
White, R.M., 2020. Insider trading: what really protects U.S. investors? J. Financ. Quant. Anal. 55 (4), 1305–1332. https://doi.org/10.1017/S0022109019000292.