The timing of stock repurchases: Do well–connected CEOs help or harm?

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Abstract

We find that CEOs with extensive professional networks, with a privileged position in the professional hierarchy, execute buybacks at higher prices relative to less connected peers. Monitoring by institutional investors and blockholders weakens the inverse relation between a CEO's network and repurchase timing. Asymmetric information does not affect this relation, indicating that informational mechanisms cannot explain our findings. We observe that better–connected CEOs are more associated with buybacks to meet EPS targets and insider net sales around repurchase transactions. Our evidence suggests that powerful, well-connected CEOs may use repurchase transactions to pursue selfish objectives rather than firm value maximization.

Keywords: Repurchase timing; CEO network centrality; Daily repurchase transactions

JEL Codes: G30; G35

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1 Introduction

Although finance research has for a long time concentrated on the features of corporations to explain firm performance and corporate financial decisions, the focus in recent years has gradually shifted towards the personal characteristics of the corporate decision–makers. For instance, recent studies highlight that CEOs are key drivers of firm performance (Bennedsen et al., 2020) and stress the importance of CEO and directors traits and attributes such as managerial "styles" (Bertrand & Schoar, 2003; Schoar & Zuo, 2017), gender (Adams & Ferreira, 2009), overconfidence (Hirshleifer et al., 2012; Phua et al., 2018), professional experience (Dittmar & Duchin, 2016), and cognitive and non–cognitive ability (Adams et al., 2018). The takeaway from this line of research is that a firm's success partly depends on its ability to pick CEOs and other executives with features that are value–enhancing and coherent with the firm's characteristics.

One important factor that is attracting growing attention among financial economists is the professional network of executives and other directors. Prior literature suggests that the appointment of a CEO with an extensive professional network (i.e., a CEO with high network centrality) can both benefit and undermine the corporate decision–making process since alternative and contrasting mechanisms can be at play. Our paper contributes to this important strand of the literature and focuses on a CEO's network of professional ties and their impact on the timing of daily buyback transactions carried out by UK listed firms. Several studies document that firms, on average, buy back own stock on the open market at bargain prices (Brockman & Chung, 2001; Cook et al., 2004; De Cesari et al., 2012; Ben-Rephael et al., 2014; Dittmar & Field, 2015).[1] Well–timed repurchase transactions boost firm value by essentially transferring wealth from selling shareholders to the firm itself. In contrast, buybacks that are carried out at comparatively high prices produce opposite effects

[1]However, Bonaimé et al. (2016) document that managers can time buybacks only in the short term, while in the long term firms would be better off if their executives simply smoothed repurchases evenly over time. Prior studies have also found that purchases of own stock can be used to support stock market valuations (e.g., Liu & Swanson, 2016; Busch & Obernberger, 2017; Andriosopoulos & Hoque, 2018)

and diminish firm value.[2] Weak incentives and/or self-interest may arguably drive managers to undertake value–destroying repurchases.[3]

Thus, the timing of buyback transactions represents an ideal setting to investigate the impact of a CEO's network on firm value in that CEO network centrality is likely to shape the cross–sectional variation in repurchase timing. Unlike other transactions (e.g., mergers and acquisitions), stock repurchases are less transformative but quite frequent, common and widespread among firms. This circumstance allows us to study a representative dataset and generate findings with significant external validity on the nexus between executive network centrality and corporate decision–making. Further, while most managerial decisions are not observable, the detailed terms of UK buybacks are publicly available allowing us to use a large and rich dataset of daily repurchase transactions. A final highlight of our study is that the effect of executive network centrality on the timing of buybacks is hard to predict *ex ante* given that several contrasting mechanisms can drive this relationship.

One possible mechanism is based on the notion that firms may value CEOs that are capable of enlarging the firm's information set and gather novel, relevant information from outside sources, which can improve the decision–making process and help generate innovative strategic insights. In this respect, CEOs with extensive professional connections can be particularly valuable owing to their ability to obtain information from their many acquaintances. Faleye et al. (2014) show that executives' connections boost corporate innovation.

[2]Practitioners seem fully aware that buybacks can reduce firm value if not properly–timed. For example, in October 13, 2011, James Dimon, CEO of JPMorgan Chase & Co., apologised for buybacks carried out earlier in the year at prices that appeared to be excessive: "It would have been wiser to wait. We are sorry" (https://www.thestreet.com/investing/stocks/dimon-says-sorry-for-buyback-screw-up-11276957). According to PricewaterhouseCoopers firms should expect to receive questions from their shareholders on repurchase timing such as the following ones: "Why is the company expending funds for common stock buybacks?" "What was the average price paid?" "In light of declines in the company's stock price, will the company implement or continue a stock buyback program?" "Why did the company repurchase so much stock earlier at such a high price?" (https://criticaleye.com/inspiring/insights-servfile.cfm?id=431&view=1)

[3]As we will explain later on, weak incentives may lead managers to reduce their effort to find the optimal time window to buy back own stock. Moreover, repurchase transactions can be executed by CEOs to support stock prices in the short term irrespective of the current level of market overvaluation of the stock. For instance, a boost to stock prices may allow CEOs to sell their own personal shares at better conditions and increase the value of their equity–linked pay. Repurchase transactions also inflate EPS figures and help executives match EPS targets set by financial analysts or contained in their compensation contracts.

Several recent studies find that companies pursue similar policies when their decision–makers are socially and professionally connected (Shue, 2013; Fracassi, 2017). Information obtained by executives from professional acquaintances can complement the set of information they already possess on their firm and enhance the executives' ability to time repurchase transactions.

However, the dark side of well–connected CEOs is that an extensive network of ties provides CEOs with power, ability to influence the appointment and activities of non–executive directors, and labour market insurance. El-Khatib et al. (2015) highlight that social ties protect CEOs from the discipline of the market of corporate control and the managerial labour market. Displaced workers face shorter periods of unemployment if their former colleagues are currently employed (Cingano & Rosolia, 2012). CEOs that are forced to leave a firm are more likely to obtain a comparable or better job if they are socially connected, and they are less likely to be fired for poor performance if they share some social ties with their directors (Nguyen, 2012). In this perspective, social connections can weaken CEOs' incentives to act in the best interest of their firm by, for instance, attempting to purchase own stock at the minimum price possible. Such connections also strengthen CEOs' ability and resolve to pursue self–serving objectives, which may drive them to conduct repurchases at comparatively high prices just to temporarily inflate stock market valuations.

Moreover, a professional network can also operate as an information conduit that enhances the diffusion of inside corporate information to outsiders that are connected to a firm's CEO. For instance, there is evidence that firms with more central directors, i.e. directors with a larger set of personal or professional connections, experience more informed trading of their stock by sophisticated traders (Cohen et al., 2008; Akbas et al., 2016; S. Cheng et al., 2019). In our context, recipients of inside information can then use it to personally purchase the stock of the firm whenever it appears to be undervalued and this circumstance may hinder the firm's ability to time buyback transactions. Thus, a CEO's network could be negatively related to repurchase timing because inside information diffuses more widely

across a larger network of connections.

On the whole, the actual impact of CEO centrality on corporate decisions is an empirical issue that can ideally be studied in the context of buybacks. We use a unique dataset of 18,067 daily repurchase transactions carried out by 335 firms over the period 1998–2014 to investigate whether firms led by CEOs with more extensive professional connections are more likely to repurchase own stock at bargain prices. Our main finding supports the view that firms managed by better–connected CEOs are less likely to purchase own stock at bargain prices and this phenomenon seems to be explained by agency and managerial incentive considerations as opposed to informational channels.

In our baseline, multivariate tests, we focus on the relationship between the relative price at which stock is repurchased and a CEO's professional network centrality as measured by a very common proxy, the normalized degree of the CEO. In these tests we control for a long set of repurchase–timing determinants and cluster the standard errors at the CEO level. In line with the study by Dittmar & Field (2015), we consider the relative price as an inverse measure of timing that is built upon the ratio between the price at which stock is bought back and benchmarks based on average market closing prices of the same stock over one, three, and six months after the transaction. Normalized degree is a measure of network centrality that reflects the total number of direct professional ties (both current and historical) with other directors and executives. We report a positive and statistically significant relationship between the relative price of a firm's buyback transaction and the degree of the firm's CEO.

This key result is generally robust to the use of: a binary dependent variable for repurchases at prices below average future market prices; alternative clustering methods of the standard errors; alternative definitions of a CEO's degree and of network centrality measures, namely closeness, betweenness, and eigenvector; alternative definitions of a firm's CEO, for example based on job titles; a dependent variable that is not affected by the market reaction generated by the announcement of the respective repurchase transaction.

One limitation of our baseline tests is that executives are not allocated in a random fashion to firms and the endogenous matching between companies and CEOs is a possible source of endogeneity biases. Our multivariate models comprise a large set of variables but one or more omitted variables could still bias our results. We adopt two empirical strategies aimed at minimizing any endogeneity biases that could affect our baseline tests. We first concentrate on small subsets of buybacks that occur around CEO turnover events, which often cause significant variations in a firm's CEO's network centrality without any non–negligible changes in firm characteristics. In this analysis we can control for any time–invariant feature of a firm through turnover fixed effects, but time–invariant unobservables may still affect turnover events. To deal with this important limitation we also estimate some standard instrumental variable regression models. We consider instrumental variables that capture the average characteristics in terms of professional network of the pool of executives that a firm is likely to be able to recruit. We observe that these instruments are indeed related to our main test variable. The additional analyses based on turnover events and instrumental variable regressions show that our main finding of a negative impact of CEO network centrality on the timing of buybacks is unlikely to be driven by endogeneity biases.

What is the network mechanism behind this key empirical regularity? In cross–sectional tests, we document that CEOs with extensive professional networks tend to purchase own stock at comparatively higher prices compared with their less connected peers only in firms with low levels of institutional ownership and without non–individual blockholders (i.e., legal entities with blocks of 5% or higher). This evidence is coherent with agency conflict and CEO power explanations: powerful CEOs with extensive networks are less likely to undertake repurchase transactions that do not benefit their firms when they are subject to the monitoring by institutional investors and non–individual blockholders. At the same time, our study lacks any evidence in favour of the alternative asymmetric–information mechanism that hinges upon the notion that larger networks tend to convey more inside information to outsiders, therefore undermining a CEO's ability to time repurchases. We observe that there

is no relationship between the average degree of non–CEO directors, who can also diffuse inside information through their networks, and the relative price of buybacks. Additionally, the level of information asymmetry does not significantly affect our main findings in the cross–section.

Why would well–connected and informed CEOs fail to purchase the stock of their firm at bargain prices? Managers with insufficient incentives could be unwilling to find the optimal time window to buy back own stock, an exercise that requires some effort and may be considered unimportant by entrenched, powerful executives, who lack discipline. Moreover, these executives can afford to carry out stock repurchases for their own purposes irrespective of whether the target stock is undervalued. Repurchase transactions can be executed by CEOs to support stock market valuations (e.g., Dittmar & Field, 2015; Liu & Swanson, 2016; Busch & Obernberger, 2017; Andriosopoulos & Hoque, 2018). A boost to stock prices allows CEOs to sell their own personal shares at more favourable conditions and inflates the value of their equity–linked pay. Edmans et al. (2017) report that CEO equity sales follow stock repurchase transactions, a clear sign that buybacks are timed by CEOs to push stock market valuations upward. Consistent with these arguments, in some of our tests we document weak evidence that CEOs with above–median levels of degree are especially likely to be net sellers of their firm's stock over the short period surrounding a buyback trade.

Furthermore, repurchase transactions mechanically inflate EPS figures and help executives match EPS targets set by financial analysts (e.g., Hribar et al., 2006; Almeida et al., 2016) or contained in their compensation contracts (e.g., Young & Yang, 2011; Y. Cheng et al., 2015; Kim & Ng, 2018). We expect powerful CEOs with many social ties to be particularly likely to engage in EPS–boosting buybacks, even when their shareholders perceive the stock to be overvalued. Indeed, we find that repurchase transactions are positively associated with the likelihood of meeting or beating EPS forecasts only when the CEO's network is extensive.

Our study contributes to the growing literature on the interplay between social networks

and corporate financial decisions and outcomes. Some previous studies concentrate on firm policies in general (Shue, 2013; Fracassi, 2017), firm performance (Larcker et al., 2013), the effectiveness of boards of directors (Fracassi & Tate, 2012; Nguyen, 2012), risk–taking (Ferris et al., 2017, 2019), innovation (Faleye et al., 2014), the cost and terms of private debt (Fogel et al., 2018), and IPO characteristics (Bajo et al., 2016). Our findings are particularly related to previous papers that highlight the potential value–destroying effect of well–connected, powerful CEOs in the context of acquisitions (Chikh & Filbien, 2011; Fracassi & Tate, 2012; Ishii & Xuan, 2014; El-Khatib et al., 2015). While the focus on acquisitions is well–justified given that they can influence the value of an acquiring firm to a significant extent, the benefit of studying daily stock repurchase transactions is that these are very frequent, common, and transparent in the UK market, allowing us to analyze the decisions of a representative sample of CEOs in great detail. In a contemporaneous study, Evgeniou et al. (2020) investigate the relation between long–run excess returns following repurchase announcements and firm centrality in the input–output trade flow network. In contrast, we are interested in the association between the centrality of top executives in the professional network and the relative price at which actual repurchase transactions are carried out.

The paper is structured as follows. We describe the dataset of repurchase transactions in Section 2. Section 3 provides information on the variable construction process alongside some descriptive statistics. The main findings of the study can be found in Section 4, while in Section 5 we present several robustness tests and additional analyses. Section 6 discusses possible endogeneity biases and presents related tests. In Section 7 we evaluate alternative mechanisms that may be coherent with our baseline results. Section 8 focuses on the effect of CEO network centrality on buybacks that help firms meet EPS forecasts and on the relation between buybacks and insider trading. Section 9 concludes.

2 Dataset of daily repurchase transactions

We use a very large dataset of 24,655 daily observations on open market repurchase transactions executed by 576 UK listed companies, excluding financial (SIC between 6000 and 6999) and utility firms (SIC between 4900 and 4949). Previous research on the timing of repurchase transactions primarily focused on US listed firms and employed data at a monthly or at a lower frequency (e.g., Dittmar & Field, 2015). The use of daily transactions allows us to more precisely measure the timing of buyback transactions. Our dataset covers the period 1998–2014 and is collected from the database Company REFS. For each daily observation we have the date of the announcement of the buyback transactions and information on pricing and volume. Announcements of repurchase transactions either coincide or just follow the trading days of the actual execution. UK listed firms are obliged to disclose their actual repurchases as soon as possible and not later than 7:30 a.m. of the subsequent business day.

Since variable construction requires information from several other sources, the baseline dataset in our paper comprises 18,067 daily observations for 335 companies. A significant number of observations is lost in the first few years of our sample period owing to the limited coverage in Boardex, the database from which CEO professional ties are obtained. Figure 1 shows the evolution by calendar year of the total number of repurchase transactions in our initial and final, baseline dataset. A steep increase in buyback frequency can be observed over the period 1998–2007, followed by a slight but significant decline in 2008, a subsequent collapse in 2009, and a recovery afterwards. This trend shows the impact of the global financial crisis on repurchase payout and is consistent with the content of a recent report from the UK Department for Business, Energy and Industrial Strategy (BEIS, 2019, p. 34) and with evidence from the U.S. (Floyd et al., 2015). In all our multivariate models we include calendar month fixed effects to control for macro shocks such as the financial crisis. In Figure 1 we also provide the number of distinct stocks that are bought back for our initial, larger dataset of repurchase transactions. This number, which fluctuates around the threshold of 100, peaks in 2008 and reaches its lowest level in 2009.

3 Variable construction and descriptive statistics

We follow the influential paper by Dittmar & Field (2015) to construct our inverse measures of repurchase timing, which allow us to investigate whether there is a relation between a CEO's professional connections and the firm's tendency to carry out buybacks at bargain prices. For each repurchase transaction, we compute the relative differences between the repurchase price and the average closing prices of the same stock over several intervals surrounding the date of the repurchase transaction. *Relative price –t to +t* is the ratio between the price at which the stock is bough back and the average closing price between month *–t* and month *+t*.[4] We alternatively set *t* equal to one, three or six. Closing prices are obtained from the database LSPD and are adjusted for dividend payments and stock splits to make them comparable to the related repurchase price. On average, *Relative price –t to +t* should be lower for firms that are more capable and/or more willing to purchase own stock from the open market at favourable prices.

We can observe negative values for *Relative price –t to +t* just because the repurchasing firm is trying to support its stock price after a market decline. This is a strategy that can be pursued by any firm or trader, regardless of the possession of any information on stock market undervaluation and possibly without any intention to time the market. On the other hand, managers with more forward–looking inside information should be more capable of buying back stock at prices that are lower than future market valuations. Dittmar & Field (2015) highlight the importance of studying forward–looking measures of buyback timing. We therefore expect another variable we build, namely *Relative price 0 to +t*, to be a more meaningful repurchase timing measure given that it compares buyback prices with future closing prices. We also build dummy variables based on the relative price measures that are equal to one when the measures are negative, and zero otherwise.

Table 1 contains the distributions for the repurchase timing measures. The median

[4]To mitigate the effect of outliers, we winsorize 2% (1% in each tail) of the observations of this and all the other continuous variables in the study.

values of the continuous measures *Relative price –t to +t* and *Relative price 0 to +t* are all negative, and the medians of the related binary proxies always take a value of one. We can conclude that more than 50% of the repurchase transactions in our sample are conducted at prices that are lower than average closing prices. This is not unexpected and confirms prior evidence on repurchase timing (e.g., De Cesari et al., 2012; Ben-Rephael et al., 2014; Dittmar & Field, 2015).

We use the UK version of the database Boardex and rely on social network analysis tools to build a measure of a CEO's professional connections (or network centrality in the jargon of social network analysis). For each year and each CEO, we count the total number of the CEO's current and historical professional ties with other directors and executives covered in the database. We assume that a tie is established between two individuals if they work for the same listed company as executives and/or directors at the same time.[5] Through this procedure, we construct the variable *Degree* that measures the number of direct professional links a CEO has in the network of all executives and directors. We employ quite an extensive definition of CEO based on job titles information from Boardex. When no executive can be found with a "CEO" job title, we first look for the presence of an executive "Chairman" or "Chairwoman", and finally consider whether the firm has a "Managing Director" or "MD". When a company has multiple joint or co–CEOs, we retain the CEO with the highest salary. In our robustness tests, we consider alternative approaches to construct our main test variables, including amendments to the CEO definition.

The top value of 2,455 for the variable *Degree* is recorded in 2011 for Kevin Loosemore, the executive chairman of Micro Focus International Plc. BP Plc and its group CEO Lord Edmund John Browne come in second place with 2,162 connections in 2006. Table 1 shows that the average value of CEOs' professional connections is 304.55 (median 164) and

[5]We concentrate on employment–related connections rather than other types of social connections (e.g., those based on education links and social activities) given that they are arguably more likely to influence firm policies to a significant extent, a contention that is supported by previous studies (e.g., Fracassi & Tate, 2012; Fracassi, 2017; Ke et al., 2019). In line with El-Khatib et al. (2015), we only consider information on ties through listed firms as the related information is probably more reliable than that for private firms.

its minimum value is two. In the empirical analyses, we use the test variable *Normalised degree*, which is a scaled version of *Degree*. It is calculated by taking the ratio between a CEO's *Degree* and the total number of directors and executives (excluding the CEO) that belong to the overall Boardex network in the same year. Using the normalised version of the degree measure allows us to mitigate two possible time–biases in our dataset. First, for an individual, *Degree* tends to mechanically increase over time as more information about the individual's employment history accumulates and is recorded in Boardex. Second, Boardex's coverage has significantly improved over time, and this again makes information on professional connections not comparable between two different periods. In Table 1, the mean (median) value of *Normalised degree* is 0.0011 (0.0005), implying that on average a CEO is connected with 0.01% of the directors and executives in our dataset. The maximum value of 0.0081 for this variable indicates that the CEO with the most extensive set of professional ties is related to nearly 1% of the other professionals.

To avoid omitted variable biases, we consider an extensive set of control variables in our regression specifications that are defined in detail in Table A1 in the Appendix. The *Number of repurchase transactions* executed in the same calendar month is likely to affect a transaction's timing since there is evidence that frequent repurchasers buy back stock at relatively higher prices (Dittmar & Field, 2015). Firm characteristics such as firm size, profitability, and leverage could matter too. They should influence the level of asymmetric information, the amount of resources that are available to purchase own stock, and the riskiness of the firm's security. We include the following firm–specific variables in our multivariate tests: *Log market capitalization*, *Operating profits*, *Market–to–book*, *Leverage*, *Cash holdings*, *Capex*, and *Dividend yield*. A firm's ability to conduct repurchase transactions at bargain prices could also depend on stock liquidity and volatility, two important dimensions that we capture through the variables *Turnover* and *Volatility*. Finally, some executive traits and attributes could correlate both with the timing of stock repurchases and our measures of professional ties. We want to make sure that our findings are not driven by spurious

correlations, therefore we consider executive features capturing whether the CEO is a male (*Male CEO*), the age (*CEO age*) and tenure (*CEO tenure*) of the CEO, her direct (*CEO direct compensation*) and equity–based (*CEO equity–based compensation*) pay, and the delta of the CEO's wealth in her firm (*CEO delta*). In some extensions to our baseline analyses we use ownership data from Refinitiv Eikon, EPS actual values and analyst forecasts from IBES, and insider trading data from Company REFS.

The descriptive statistics for all the control variables in the baseline multivariate models can be found in Table 1. Firms that repurchase stock in a particular month tend to do so quite actively and frequently. The mean (median) value of *Number of repurchase transactions* is 11.76 (12). On average, 3.51% of a firm's market value of equity is distributed through cash dividends. 96% of CEOs are males and average CEO age and tenure are around 52 and 6 years respectively.

We report the cross–correlations between *Normalized degree* and all the control variables above in Table 2. If we only consider the large correlations in absolute value, we observe that a CEO's professional ties are positively associated with the frequency of repurchase transactions, firm size, and the CEO's pay and wealth delta. Correlation coefficients are never very high, thus multicollinearity should not plague our results.

4 Main results

In Table 3 we report the baseline OLS regression outputs for six alternative specifications: three for the continuous inverse timing measure *Relative price –t to +t* and three for the other dependent variable *Relative price 0 to +t*. In our multivariate models, we include the extensive set of control variables described in Section 3 alongside calendar month and SIC–2 industry dummies. Since our test variable *Normalized degree* is CEO–specific, we compute the *t–statistics* of the regression coefficients employing conservative standard errors that are robust to heteroskedasticity and clustered at the CEO level to account for within–

CEO serial correlation. As we explain below, our findings are qualitatively unchanged if alternative clustering strategies are considered.

The first three columns of Table 3 show that the a CEO's *Normalized degree* is positively related to the three alternative versions of the dependent variable *Relative price –t to +t*. However, the coefficient on the test variable is statistically significant at a 10% level only when the benchmark average closing price is calculated over the two–month period around the repurchase event. We can conclude there is some very weak evidence that CEOs with more extensive professional connections tend to buy back the own stock of their firm at prices that are above average on the stock market.

The remaining three columns of the table provide stronger evidence in favour of this notion in relation to a type of dependent variable that constitutes a more direct measure of timing ability and is forward–looking (Dittmar & Field, 2015). We report a positive and statistically significant (always at a 1% level) relation between our test variable *Normalized degree* and the inverse timing measure *Relative price 0 to +t*. The coefficient on the test variable becomes larger and more statistically significant as we extend the interval over which the benchmark average price is recorded. If we consider the regression coefficients of the sixth column, we calculate that a one standard deviation positive change in *Normalized degree* is associated with an increase in *Relative price 0 to +6* of approximately 0.18 standard deviations. The effect of a CEO's degree on the timing of repurchase transactions appears economically significant. Moreover, it is remarkable that the coefficients on most of the control variables are not statistically significant, despite the relatively high values of the *Adjusted R–squared* statistic. This circumstance indicates that in the professional ties of a firm's executives we have identified a key determinant of the firm's tendency to purchase own stock at bargain prices.

Another statistically significant factor is the frequency of repurchase transactions, captured by the variable *Number of repurchase transactions* for which a positive coefficient is reported. In line with our expectations and previous evidence (Dittmar & Field, 2015),

firms that frequently repurchase stock tend to do so at relatively higher prices. The economic significance of *Number of repurchase transactions* is only marginally larger than that of *Normalized degree*, indicating that both these variables represent first–order determinants of repurchase timing. For instance, a one standard deviation boost to the former variable is related to a positive change in *Relative price 0 to +6* of around 0.21 standard deviations. An additional control variable that normally has a statistically significant effect on the timing of buybacks is *CEO tenure*. It is often argued that executives with longer tenures are more entrenched and can afford to under–perform (e.g., Berger et al., 1997). This conclusion could explain why we observe that a CEO's tenure is negatively associated with repurchase timing.

We re–run the same OLS regression specifications replacing the continuous relative price measures with their respective binary versions, employing a linear probability model estimation method. The results for these additional tests can be found in Table 4 and are on the whole aligned with those reported in the previous table. The coefficient on the independent variable of interest *Normalized degree* is always negative and statistically significant across the six timing measures. The statistical significance of the variable is higher in the last three columns of the table in which we are trying to explain the likelihood that a firm conducts a repurchase transaction at a price that is below the future average closing price over a period that ranges from one to six months. If we focus on the sixth column, a one standard deviation reduction in *Normalized degree* is associated with an increase in the probability of a repurchase at bargain prices of 6.69%, which represents around 11% of the average value of *Relative price 0 to +6 dummy*.

As for the control variables in Table 4, *Number of repurchase transactions* is the only one for which the regression coefficient is always highly statistically significant across the six models. There is a confirmation that a firm's likelihood of timing repurchase transactions is lower if the firm purchases own stock more frequently. In column six, the economic significance of *Number of repurchase transactions* is lower than that of *Normalized degree*. A one standard deviation decrease in the former variable is related to a boost to *Relative price*

0 to +6 dummy that amounts to just 6% of its mean. Other findings are less robust, but we observe that repurchase timing is positively (negatively) associated with the variables *Market–to–book*, *Male CEO*, and *CEO equity–based compensation* (*Turnover*), at least in three regressions out of six.

Overall, our multivariate tests show that CEOs that are more central in the network of executives and directors and with more extensive professional ties do not use their professional ties to gather information and time the repurchase transactions of their firms better than less connected peers. Instead, they execute such transactions at prices that are comparatively higher relative to the market values of their stocks over the following months. The relationship between our measure of a CEO's professional ties *Normalized degree* and the repurchase timing proxies is economically significant and of first–order importance.

In the next section, we aim to test the robustness of our findings to variations in the clustering of standard errors and in the definitions of the repurchase timing measures, the network variables, and a firm's CEO. From this point onwards, we only focus on the dependent variable *Relative price 0 to +t* since it is more informative compared with the corresponding binary variable. Moreover, it offers more robust findings compared with the alternative continuous measure *Relative price –t to +t*, which is also less meaningful being a less direct measure of timing.

5 Robustness tests and additional analyses

5.1 Clustering of standard errors

We test the robustness of our baseline multivariate results (reported in the last three columns of Table 3) to changes in the clustering of the standard errors. While our main test variable is CEO–specific, other control variables are recorded at the firm level. Moreover, a CEO's professional connections can also be influenced by the features of the firm she works for. Thus, one can argue within–firm clustering is suitable too in our regression models. We

employ this method of clustering to re–estimate our regression models and report the output of our exercise in columns (1), (3), and (5) of Table 5. We confirm that *Normalized degree* is a positive and statistically significant determinant of a firm's repurchase price relative to the firm's average market stock price over subsequent periods. Another aspect to consider is the cross–sectional correlation induced by the overlapping periods over which the repurchase transactions sometimes take place. To take this empirical issue into account, in columns (2), (4), and (6) of Table 5 we estimate the regression standard errors using a double clustering by both CEO and calendar month of the buyback transaction. The findings reported in these columns are qualitatively similar to those that we have previously described. A conclusion we can draw is that our baseline findings are not particularly sensitive to alternative clustering approaches.

5.2 Alternative network measures

Several methods have been adopted in previous studies to standardize measures of executive professional ties. An alternative approach to ours is adopted by El-Khatib et al. (2015), who utilize the percentile of a CEO's degree computed annually and based on the distribution of the same variable for all the executives and directors of public companies in the same year. We replace *Normalized degree* with a similar percentile variable for our *Degree* measure in the multivariate tests. The new findings can be found in the top three rows of Table 6. As expected, the coefficient on the new test variable is positive and statistically significant, even though just at a 10% level. The reduction in significance could be explained by the loss of information driven by the percentile transformation of the continuous proxy.

The CEO degree measure we employ in the baseline tests is based on all the professional links that are available in the UK Boardex database up to the current year, irrespective of their strength and whether they are still active. Following El-Khatib et al. (2015), we calculate two alternative, and more narrow, degree measures based on subsets of connections. First, we purge our connections dataset of all the links that have been inactive in the past

five years and obtain an *active* version of the *Normalized degree*. Second, we only keep links that last for at least three years and drop the remaining ones, resulting in a test variable based on *stable* links. The regression coefficients for these two alternative test variables can be found in rows (4)–(9) of Table 6. They are always positive and statistically significant at least at a level of 5%. It is important to highlight that the size of the coefficients for the degree measure built using active links are significantly larger than those reported in Table 3 for the main test variable, while those for the proxy based on stable connections are approximately equivalent to the baseline case. Whether professional ties are currently active or not has an effect on the timing of buyback transactions carried out by the CEO, in line with previous studies (e.g., Fracassi, 2017) showing that current employment connections are more relevant than past employment ties.

Degree is by far the most widely–used network centrality measure, but previous studies have also considered three main alternatives (e.g., El-Khatib et al., 2015; Fracassi, 2017): closeness, betweenness, and eigenvector. It is beyond the scope of this paper to provide detailed technical definitions of these alternative network variables, which can be found in previous studies. We construct them employing all the information on professional links (both current and historical) from the UK version of Boardex and adopting the same scaling as for *Degree*. Intuitively, closeness reflects how easily an executive can reach other directors, by capturing the inverse of the average distance between a CEO and every other individual in the network. Betweenness measures how important a CEO is in terms of connecting other directors, as it measures the number of shortest paths connecting two individuals in the network that go through the CEO. Eigenvector essentially links a CEO's centrality to her neighbours' characteristics, capturing how important, central, or highly influential a CEO's connections are. As documented in rows (10)–(18) of Table 6, the results for both *Normalized closeness* and *Normalized betweenness* strongly support our conclusion that employing a well–connected CEO is associated with less repurchase timing. Surprisingly, we cannot report any statistically significant coefficients for *Normalized eigenvector*. Our results

suggest that it is the CEO's position in the director network and her centrality that matters, not the centrality of the directors linked to her. Degree, closeness, and betweenness are network centrality measures that primarily capture the relevance of a CEO's connections in terms of number of links and/or potential for connectivity. In contrast, eigenvector reflects more the relevance of the individuals the CEO is connected to. In this perspective, degree, closeness, and betweenness are arguably more strongly related to managerial entrenchment than eigenvector, which in turn better reflects a CEO's informational advantage over other agents according to Goergen et al. (2019).

We finally evaluate whether other social ties matter besides those linked to professional roles and board directorships that we consider more relevant in our study. In untabulated tests, we replicate our baseline regressions by including a CEO's *Network Size* from Boardex, which broadly reflects professional and educational connections together with those from other activities undertaken by the CEO. We find that this variable is not significantly related to our timing measures and this circumstance constitutes a further justification for our focus on professional connections.

5.3 Other robustness tests

We further investigate whether the baseline findings of our study are sensitive to alternative definitions of a firm's CEO. In rows (1)–(3) of Table 7, we re–estimate our regression models employing a dataset that is purged of firm–years with multiple CEOs. In the remaining three rows of the table, we employ a stricter definition of CEO and exclude observations for firms without an executive with a "CEO" job title. In all six rows of Table 7, we observe that the results for the test variable *Normalized degree* are qualitatively similar to those in Table 3.

In untabulated tests, we investigate whether reactions to announcements of daily transactions may drive our findings. A possible concern is that repurchase transactions carried out by less known and more opaque firms, which may employ executives that are less socially

connected, could generate larger positive market reactions. This empirical regularity could create the positive relation we report between *Normalized degree* and the repurchase timing measures *Relative price 0 to +t*. However, our results are robust to the use of alternative timing measures based on average closing prices computed over periods that do not comprise the day of the buyback announcement and the two subsequent days. Finally, we notice that the correlation between our main test variable and the control *Log market capitalization* is not very high, but still quite large. Our results remain robust if we drop this control variable in our regressions.

6 Endogeneity biases

In the previous sections, we have provided robust evidence on an inverse relation between the extent of a CEO's professional connections and her firm's tendency to purchase own stock at relatively low prices. However, executives are not allocated in a random fashion to firms and the endogenous matching between companies and CEOs is a potential source of endogeneity biases. Reverse causality probably does not plague our tests since firms and CEOs are unlikely to choose one another based on considerations pertaining to repurchase transactions and their timing. Besides, our evidence indicates that CEOs that could be appointed by firms owing to their extensive network and informational advantage are associated with less, not more, timing. In contrast, omitted variable biases represent a serious concern. Despite our efforts to control for a very large set of possible determinants of buyback timing, we cannot rule out the possibility that one or more omitted variables may be biasing our findings.

We describe below several additional tests aimed at evaluating the effect of possible endogeneity biases on our findings and mitigating their impact. We start by looking at the timing of repurchase transactions around CEO turnover events, which should lead to significant changes in the professional connections of a firm's CEO without substantial changes in the firm's features. We then complement these tests with more standard instrumental

variable regressions based on several instruments that should not have a direct impact on our timing variables.

6.1 CEO turnover tests

By investigating the relation between the test variable *Normalized degree* and the timing measures *Relative price 0 to +t* around CEO turnover events we can properly control for time–invariant, firm–level omitted variables, alongside the extensive set of observable controls that we already consider in our multivariate tests. Another important benefit is that turnovers may lead to significant changes in the features of the professional network of a firm's CEO, something that is unlikely to be observed outside these events. In other words, a firm can replace a CEO with a very extensive set of professional links with one that is far less connected, or vice versa. It is valuable to investigate whether and how these sudden shocks affect the extent to which repurchases are executed at bargain prices.

We select instances of CEO turnover using information from Boardex, identifying cases in which the identity of a company's CEO changes from one year to the next. Specific turnover dates are obtained from the Boardex Announcements file. We create two different datasets of repurchase transactions around turnover events. In the first one, which comprises 31 turnovers, we focus on transactions that take place over the two–year period around the turnover date. In the second one (34 turnovers), we consider the two years before and the two years after this date. Changes in CEO without buyback transactions both before and after the turnover date are dropped from our datasets, so are those events that are contaminated by other CEO turnovers taking place over the respective pre– and post–turnover windows.

In untabulated tests, we investigate whether there are systematic changes in our independent and dependent variables when a turnover takes place. We find that the values of the variables *Relative price 0 to +t* increase around a turnover event and that such changes are sometimes weakly statistically significant in our larger dataset of turnovers. In contrast, the value of the test variable *Normalized degree* tends to decline, but the variation is not

statistically significant. This is somewhat reassuring in that it shows that any findings that we may obtain in our multivariate tests are unlikely to be the by–product of changes in the test variable that are common across many firms and merely driven by turnovers. Besides, if anything, this simple preliminary tests would point towards a positive relation, not negative, between an executive's professional ties and the timing of stock repurchases. While the variation in *Normalized degree* is on average small and insignificant during a turnover, we observe large changes in the variable are quite common. For example, the 90^{th} (top) percentile of the change in *Normalized degree* amounts to 0.0005 (0.0010). This change would push the median CEO in our baseline sample with a median *Normalized degree* of 0.0005 to just below (well above) the 75^{th} percentile of this variable. We also find that new CEOs are significantly younger and enjoy smaller direct compensations and deltas. Reassuringly, variations in firm–specific variables around turnover events are normally statistically insignificant.

In the first three columns of Table 8 we replicate our baseline regression models of Table 3 considering the transactions from the first dataset above, while in the remaining three columns we employ the second, more extensive dataset. In these regressions we include turnover fixed effects to control for time–invariant omitted variables, such as unobservable firm features that do not change from the pre– to the post–turnover period. In five models out of six, the coefficient on *Normalized degree* is positive and statistically significant at a 1% level. This evidence is aligned with the findings from our baseline tests and indicates that a firm experiences an increase in the relative price at which buybacks are conducted if the firm replaces its CEO with a new executive with more extensive professional ties.

The analysis in this section suffers from an important weakness: a CEO turnover is not necessarily an exogenous event given that it is dependent on decisions by the firm and/or the CEO; such decisions could, in turn, be related to one or more underlying variables, which could also determine the timing of repurchase transactions. The empirical strategy we employ allows us to control for the confounding effects of several time–varying observable control variables and turnover–specific, time–invariant unobservable variables. However,

unobservable variables that vary during the turnover event cannot be controlled for. Next, we adopt an entirely different approach to tackle the endogeneity problem.

6.2 Instrumental variable regressions

In this section, we estimate some instrumental variable regression models to account for the endogeneity issue affecting our test variable. Valid instrumental variables should be strongly correlated with the size of a CEO's professional network without directly affecting the timing of the stock repurchases that are carried out by the CEO's firm. Finding such instrumental variables is very challenging. Moreover, instruments' exclusion restrictions cannot be tested directly, and this is a major limitation.

Nevertheless, we propose that variables capturing the supply of qualified executives on the CEO job market could represent suitable instruments. Job markets for executives are segmented in that firms face some frictions, such as the lack of information, and searching costs when attempting to recruit a new CEO. Thus, their choice is somewhat limited, and some qualified candidates are more likely to be hired than others, irrespective of the recruiting firms' ideal preferences. In other words, the endogenous matching between firms and CEOs is partly driven by frictions, besides the preferences of the parties involved.

We conjecture that a company tends to recruit executives that belong to the industry in which the company operates for the position of CEO. In other words, a company is more likely to hire CEOs with previous professional experience from the same industry as the company than executives without any relevant industry experience. Firms very often hire CEOs internally without resorting to the external job market (e.g., Parrino, 1997; Cremers & Grinstein, 2014), and firm insiders obviously belong to the industry in which their firm operates. In the case of external appointments, there is evidence that a large fraction of newly–recruited CEOs are industry insiders (e.g., Parrino, 1997; Bertrand & Schoar, 2003; Cremers & Grinstein, 2014). Moreover, firms' actions sometimes appear to reflect the concern that their executives could be poached by their industry peers. A manager's compensation is

often benchmarked against the pay offered by industry peers in order to facilitate retention (e.g., J. M. Bizjak et al., 2008; J. Bizjak et al., 2011; Coles et al., 2018).

Grounded on these premises, we argue that firms tend to recruit CEOs from industry–specific pools of potential candidates, meaning that features of the appointed CEOs are more likely to resemble those of directors that are professionally linked to the firms' industry. We, therefore, build an instrumental variable that exploits this empirical regularity and considers the supply of executives as follows. For a repurchase transaction made by a focal firm, we compute the average value of *Normalized degree* for all the directors in Boardex UK for the same year of the repurchase and the same SIC–2 industry as the firm's, excluding the firm's CEO. The average number of directors we employ to build this variable is 342. We observe that the instrument varies quite substantially and ranges from a minimum of 0.00009 to a maximum of 0.0022 (the range is 0.00002–0.0081 for the instrumented test variable *Normalized degree*). This result shows that there are significant industry effects that are associated with the extent of an executive's professional connections.

In columns (2)–(4) of Table 9 we report the second stage instrumental variable regressions replicating our baseline regression models of Table 3. In line with the baseline OLS findings, we find that the coefficients on *Normalized degree* are positive and statistically significant, and quite similar in terms of magnitude to those we obtain in our initial tests. The first stage estimates, which can be found in column (1), confirm our conjecture that a CEO's professional network is strongly related to that of her industry peers. The coefficient on the instrument is positive and very significant, and the instrument appears very strong. The p–value of the underidentification test is well below 10% and the Kleibergen–Paap rk Wald F statistic is significantly above ten.

We are not aware of any reason as to why our instrument should directly affect the timing of repurchase transactions rather than just indirectly through its impact on the degree of a CEO. Our approach is consistent with many studies in recent years that employ instruments built using averages of the instrumented variable for sub–groups of firms (e.g.,

Laeven & Levine, 2007; Faccio et al., 2011; Lin et al., 2011; Ferrell et al., 2016). Nevertheless, Larcker & Rusticus (2010) and Gormley & Matsa (2014) describe some limitations of these instruments, essentially highlighting that industry average values of the test variable could comprise a component that is endogenous. This concern is arguably less relevant in our case since we build our instrument considering the complete set of directors (both executive and non–executive) and not just the CEOs of industry peers. Moreover, the inclusion of industry fixed effects in all our specifications at least allows us to control for any industry–level time–invariant omitted variables.

It is also reassuring that in unreported tests we find that our second–stage instrumental variable results remain qualitatively similar if we use two alternative instruments. These are the average *Normalized degree* for the CEOs (as opposed to directors) of industry peer firms measured in the same year (excluding the firm's CEO) and the number of listed firms that are located within 60 miles of the focal firm's headquarters. The rationale underlying this latter instrument is that besides industry segmentation, the labor market is also geographically segmented. In the presence of time constraints and travelling costs, relevant outside opportunities are more likely to come from firms located nearby rather than from firms that are farther away. Therefore, we would expect an executive's number of directorships to be larger when more opportunities are available in geographically proximate areas. We indeed find a positive relation between the geographical instrument and *Normalized degree*, although the instrument is rather weak.

7 Why do well–connected CEOs repurchase stock at higher prices?

In the previous sections, we have provided substantial evidence that CEOs that are more central in the professional network of executives do not buy back stock at bargain prices. On the contrary, they actually spend comparatively more relative to future market valua-

tions to carry out repurchase transactions compared with executives with fewer professional connections. CEOs with extensive professional networks do not seem to exploit the private information they possess or can gather to properly time repurchases and benefit their firm. What are the underlying network mechanisms that can explain our findings?

The first possible mechanism we study is related to the notion that a CEO with an extensive professional network is powerful and arguably well–protected from the discipline of the corporate control and managerial labour markets (Cingano & Rosolia, 2012; El-Khatib et al., 2015) or the actions of her firm's directors in case of poor performance (Nguyen, 2012). An extensive set of connections can, therefore, reduce an executive's incentive to maximize shareholder value and strengthen their ability to pursue self–serving objectives. Consistent with this mechanism, we would expect the association between a CEO's degree and our inverse timing measures to be less positive in those firms endowed with more effective governance mechanisms, which can limit the actions of powerful CEOs with misaligned incentives. For example, effective monitoring mechanisms can reduce the number of instances in which repurchases are executed at market prices that are considered overvalued by firm insiders and/or outside investors that gather and possess private information on the firm. Institutional investors with substantial blocks of shares are arguably capable of and interested in monitoring the firms they invest in, so are possibly other types of corporations with substantial equity stakes.

To test our expectations, in Table 10 we conduct several cross–sectional tests based on interactions between a *High normalized degree* dummy (which equals one if *Normalized degree* is above or equal to its median) and binary variables based on ownership by institutional investors such as mutual and hedge funds and other types of institutions such as foundations and holding companies. In all the regressions we include the same set of control variables as in the baseline models alongside other ownership variables.[6] We show in Panel A that

[6]Our ownership dataset is from Refinitiv Eikon and includes information on ownership stakes by institutional investors ("Bank and Trust", "Brokerage Firms", "Endowment Fund", "Hedge Fund", "Hedge Fund Portfolio", "Independent Research Firm", "Insurance Company", "Investment Advisor", "Investment Advisor/Hedge Fund", "Mutual Fund", "Pension Fund", "Pension Fund Portfolio", "Private Equity", "Research

the interaction term between *High normalized degree* and that for firms with high levels of institutional ownership has a negative and statistically significant coefficient, which is in absolute terms similar to the positive coefficient for the high–degree dummy. We can conclude that the underperformance in terms of repurchase timing primarily affects well–connected CEOs of firms with low levels of ownership by institutional investors. Similarly, in Panels B and C we observe that high–degree CEOs are less likely to buy back stock at bargain prices mostly when there is no institutional investor and/or any other type of institution with a block of shares of at least 5%.

These findings are consistent with our first mechanism according to which CEOs with extensive networks can afford to repurchase stock at relatively high prices owing to their power and their superior ability to minimize any form of discipline. In firms with better monitoring by investors we do not, in fact, observe any substantial differences between these executives and their less well–connected peers. However, in further tests (not tabulated) we find that other governance characteristics such as board size and independence do not seem to explain the cross–sectional variation in our results possibly indicating that some governance mechanisms may not be effective to push executives to time repurchases.

In our second, alternative mechanism we consider that a professional network can also function as an information conduit that facilitates the diffusion of inside corporate information. Outsiders are more likely to obtain insider private information on a particular firm if they belong to the professional network of the firm's CEO. A CEO can (whether deliberately or not) convey value–relevant, material information on her company to her acquaintances who can then exploit it through trading. This phenomenon can be particularly significant when the CEO has many connections. Past studies find that firms with better connected directors experience more informed trading of their stock by sophisticated traders (Cohen et al., 2008; Akbas et al., 2016; S. Cheng et al., 2019). In our context, recipients of inside information can then use it to personally purchase the stock of the firm whenever

Firm", "Sovereign Wealth Fund", and "Venture Capital"), other institutions ("Corporation", "Foundation", and "Holding Company"), and individuals.

it appears to be undervalued. In some instances, they may front–run the firm itself and cause adjustments to market valuations that may prevent the firm's CEO from timing stock repurchases. Thus, the negative relation between a CEO's network and her ability to time repurchases is possibly explained by the circumstance that inside information is diffused more widely across a larger network of connections.

If this were the case, we would expect to find firms with well–connected directors (on top of well–connected CEOs) to experience lower timing of repurchase transactions. The professional network of these directors can spread inside information as much as that of the CEO. The results reported in Table 11 appear to contradict our expectation and do not offer support for our second mechanism. Both the average *Degree of other directors* and the average *Degree of other executive directors*, which reflect the professional network centrality of non–CEO directors, are not significantly related to our timing measures, unlike *Normalized degree* the coefficient of which still has a positive sign. Furthermore, additional unreported tests show that the effect of a CEO's degree on the relative price at which stock is repurchased is not less positive in firms with lower levels of asymmetric information as proxied by high firm size, high stock turnover, low stock volatility, high number of EPS forecasts, low dispersion of EPS forecasts, and low EPS forecast error. The second mechanism we consider is based on the diffusion of inside information and should, therefore, be less effective when the information gap between insiders and outsiders is already narrower. However, this is not what we observe.

8 Repurchases, EPS surprises, and trades by CEOs

To better understand the factors and incentives that may drive well–connected CEOs to undertake less well–timed buybacks, we consider additional evidence on the interplay between analyst EPS forecasts and purchases of own stock as well as between the latter and insider trades by CEOs. First, we consider the role of repurchases as a tool to inflate EPS

figures to meet analyst forecasts expectations. Our aim is to determine whether this type of repurchases, which are not necessarily a function of stock market undervaluation, are more common among highly–central CEOs. Next, we examine the personal trading of company stock by the CEO around repurchase transactions. Whenever a firm and its CEO do not trade in the same direction, this can be a sign of a misalignment between corporate and CEO's private benefits. It is important to ascertain whether discordant trades between firm and managers are more common in firms led by CEOs with large professional networks.

8.1 Repurchases and EPS surprises

Repurchase transactions can benefit managers by increasing EPS figures and help them achieve EPS targets set by financial analysts (e.g., Hribar et al., 2006; Almeida et al., 2016) or contained in executive compensation contracts (e.g., Young & Yang, 2011; Y. Cheng et al., 2015; Kim & Ng, 2018). EPS-boosting buybacks can be carried out by a CEO irrespective of her professional network, but more powerful CEOs with larger networks can better afford to engage in such transactions even when the market value of their stock appears to be comparatively high. We report below some evidence that corroborates this argument.

In Table 12 we study whether the number of trading days with repurchase transactions over several periods preceding the disclosure of an annual EPS figure is associated with the likelihood of a positive EPS surprise from the IBES database.[7] The dataset used (2,997 observations in total) comprises all the firm-year observations with IBES information over the sample period, but we exclude EPS announcements in 1998 since we require at least 12 months of repurchase data for each event. The number of days with repurchases can be zero in some periods, but we do not include firms that are not covered in our main dataset of daily buyback transactions.

In Panel A, we report that the average number of days with buybacks is larger in case of a positive EPS surprise than when the firm records a negative surprise. The difference

[7] We record a positive surprise when the actual EPS disclosed by the firm is larger or equal to the consensus mean EPS forecast reported by IBES

in mean values is always statistically significant over the time intervals that overlap with the six months preceding the EPS announcement, while there is no significance outside this period. The association we highlight supports the notion that firms are currently more likely to meet or beat analyst forecasts when they have repurchased own stock in recent months. We next distinguish between high-degree (Panel B) and low-degree (Panel C) CEOs, based on the in–sample median level of degree. We can largely confirm the full–sample results of Panel A in the sub–sample of EPS announcements for CEOs with professional networks of above–median extension, although the new findings are only statistically significant over the three months preceding an announcement. On the other hand, the differences in means for low–degree CEOs are never statistically significant.[8]

In Table 13 we take the analyses above a step forward, by estimating three multinomial logit models, and find consistent evidence. In our multivariate models we control for a large set of variables: *Log market capitalization*, *Operating profits*, *Market–to–book*, *Leverage*, *Cash holdings*, *Capex*, *Dividend yield*, *Male CEO*, *CEO age*, *CEO tenure*, *CEO direct compensation*, *CEO equity–based compensation*, *CEO delta*. The test variable is the number of days with repurchases over one month (Panel A), two months (Panel B), and three months (Panel C) before the disclosure of a firm's EPS. The four possible outcomes of the multinomial logit are based on the intersection between the sign of a firm's EPS surprise and the firm's CEO network centrality; specifically, the four possible outcomes are as follows: negative EPS surprise and high–degree CEO, which is the base outcome; negative EPS surprise and low–degree CEO; positive EPS surprise and high–degree CEO; positive EPS surprise and low–degree CEO. The only statistically significant finding we can highlight in the multivariate models is that the number of buybacks boosts the odds of a high–degree

[8]Over our sample period, UK firms faced some restrictions when conducting repurchases over so–called "closed", "prohibited" or "restricted" periods contained in Listing Rules 12.2 on 'Prohibition on purchase of own securities' (now superseded). A closed period is either the two months preceding the EPS announcement or, if shorter, the period between the end of the fiscal year and such announcement. However, repurchases were not banned over such period and could still be carried out, for example, when the buyback programme was pre-arranged in advance in terms of quantities and dates or when the programme was managed by an independent third party. We would, therefore, expect buybacks executed in a closed period to be less well–timed

CEO having a positive surprise compared with the base outcome in which the surprise is negative for the same type of CEO. However, this result is marginally insignificant in Panel C. Repurchase activities do not seem to help low–degree CEOs generate a positive surprise.

Overall, the evidence indicates that repurchase transactions correlate with a firm's ability to meet or beat an EPS forecast only when the firm is lead by CEOs with large networks. While we cannot directly observe the intentions of executives, this evidence suggests buyback transactions are effective as a tool to match analyst forecasts particularly in firms led by well-connected CEOs. Thus, at a minimum, these executives have an incentive to boost their firms' EPS by carrying out buyback transactions.

8.2 Insider trading activities by the CEO

Executives may have an incentive to undertake repurchase transactions that support or inflate stock market valuations even when the stock cannot be bought back at favourable prices. These activities can benefit CEOs by allowing them to sell their own personal shares at better prices. Supporting evidence on this is reported by Edmans et al. (2017) who show that CEO equity sales tend to follow stock repurchase transactions, possibly an indication that buybacks are deliberately used by CEOs to push stock market valuations upward. Similarly, Bonaime & Ryngaert (2013) report that in quarters with stock repurchases the likelihood of net insider selling is higher than usual. Thus, firms and their insiders do not necessarily trade in the same direction. Starting from these findings and their interpretation, we study CEO insider trading activities around dates of repurchase transactions, also testing whether insider trading strategies depend on executive network centrality. The main theme of our study so far is that executives with large professional networks are less likely to undertake well–timed repurchase transactions. A implication that follows from this theme is that these executives in particular could also tend to purchase stock on behalf of their firms while at the same time carrying out insider trades in the opposite direction, which more directly affect their wealth.

We use data on insider trades from Company REFS to build our dependent variables in this section. These are two dummies that capture whether a firm's CEO is a net seller of her firm's shares over the period from one month before to one month after a repurchase transaction or over the month following the transaction. We exclude insider deals related to the exercise of executive stock options since these could routinely happen on pre–set dates. Trades by CEOs are not that frequent and our dummies very often take a value of zero. This is a limitation that can prevent us from obtaining robust and statistically significant findings.

The multivariate, probit analyses of Table 14 provide mixed evidence on the relationship between a CEO's degree and the probability that she is a net insider seller over periods surrounding buyback trades. The coefficient on the continuous variable *Normalized degree* is statistically insignificant in columns (1) and (3). In contrast, in the remaining columns of the table, we report statistically significant evidence that CEOs with above–median levels of network centrality are more likely to be net sellers of their firms' stocks that less well connected CEOs. On the whole, we can report some weak evidence in favour of our above prediction: the association between stock buybacks and contemporaneous or following net sales of shares by CEOs is stronger in firms led by executives with larger networks.

9 Conclusion

We use a very large dataset of UK daily buyback transactions to study whether a CEO's professional ties have an impact on the timing of stock repurchases. CEOs that are central in the professional network of executives are particularly capable of gathering information that can enhance their ability to purchase own stock at bargain prices. However, their extensive network can also facilitate the spread of inside information to outsiders, which may reduce their firm's ability to time repurchase transactions.

Agency explanations are relevant too in this context. Well–connected CEOs are, in fact,

more powerful and entrenched, while enjoying ample opportunities to find a new position in case of dismissal from their current job. Thus, CEOs with extensive professional networks may have weak incentives to optimize the execution of buybacks and minimize repurchase prices, also because they may instead use repurchase transactions to pursue selfish objectives such as boosting stock market valuations in the short term.

Our main finding is that CEOs with high network centrality tend to carry out buybacks at higher prices relative to less connected peers. A mechanism based on agency conflicts and CEO power seem to be best suited to explain our findings. First, monitoring by institutional investors and blockholders makes the inverse relation between a CEO's network and repurchase timing significantly weaker. Second, informational mechanisms do not help us explain our findings since asymmetric information does not affect the relation between network centrality and repurchase timing.

Appendix

Table A1. Variable definitions

This table reports detailed definitions for all the variables used in the study.

Panel A. Main dependent and CEO network variables

Variable	Definition
Relative price $-t$ to $+t$	Daily repurchase price scaled by the average value of the closing price (adjusted for dividends and splits) from t months before to t months after the day of the repurchase announcement, minus one (sources: Company REFS and LSPD).
Relative price 0 to $+t$	Daily repurchase price scaled by the average value of the closing price (adjusted for dividends and splits) from the day of the repurchase announcement to t months after this date, minus one (sources: Company REFS and LSPD).
Relative price $-t$ to $+t$ dummy	Dummy that is set to one if *Relative price –t to +t* is less than zero, else 0 (sources: Company REFS and LSPD).
Relative price 0 to $+t$ dummy	Dummy that is set to one if *Relative price 0 to +t* is less than zero, else 0 (sources: Company REFS and LSPD).
Degree	The total number of a CEO's direct professional ties with other directors and executives. A tie is assumed if two individuals work for the same firm at the same time. Both current and historical information on employment profiles are considered (source: Boardex UK).
Normalized degree	A CEO's *Degree* scaled by the total number of directors and executives (excluding the CEO) that belong to the overall network in the same year (source: Boardex UK).
Percentile of degree	The value of the percentile of a CEO's *Degree* based on the distribution of this variable for all the executives and directors of UK companies (source: Boardex UK).
Normalized degree – Active ties	CEO's *Normalized degree* only based on connections that have been active in the past five years (source: Boardex UK).
Normalized degree – Stable ties	CEO's *Normalized degree* only based on connections that last for at least three years (source: Boardex UK).
Normalized closeness	The inverse of the average distance between a CEO and any other individual in the network (source: Boardex UK).
Normalized betweenness	The number of shortest paths connecting two individuals in the networks that go through the CEO (source: Boardex UK).
Normalized eigenvector	The number of CEO connections that are weighted by their relative centrality (source: Boardex UK).
High normalized degree	Binary variable that equals one for values of *Normalized degree* that are equal to or larger than the in–sample median value of the variable, and zero otherwise (source: Boardex UK).
Degree of other directors	Average *Normalized degree* of all the non–CEO directors of the focal firm (source: Boardex UK).
Degree of other executive directors	Average *Normalized degree* of all the non–CEO executive directors of the focal firm (source: Boardex UK).

Panel B. Other variables

Variable	Definition
Number of repurchase transactions	Total number of repurchase transactions carried out by the same firm in the same month (source: Company REFS).
Log market capitalization	Log of inflation-adjusted market capitalization in thousands of 2014 GBPs (source: Worldscope).
Operating profits	Operating income over total assets (source: Wolrdscope).
Market-to-book	Market value of assets over book value of assets (source: Wolrdscope).
Leverage	Total liabilities over total assets (source: Worldscope).
Cash holdings	Cash and cash equivalents over total assets (source: Wolrdscope).
Capex	Capex over total assets (source: Wolrdscope).
Dividend yield	Common dividends over market capitalization (source: Worldscope).
Turnover	Average monthly turnover (value of shares traded over market capitalization) for the year of the repurchase transaction. A minimum of six monthly observations are needed to compute this variable (source: LSPD).
Volatility	Average monthly volatility (standard deviation of daily log-returns times ten) for the year of the repurchase transaction. A minimum of six monthly observations are needed to compute this variable (source: LSPD).
Male CEO	Dummy that is set to one if the CEO is a male, else zero (source: Boardex UK).
CEO age	Age of the CEO in years (source: Boardex UK).
CEO tenure	CEO's time in role (source: Boardex UK).
CEO direct compensation	Log of one plus the CEO's inflation-adjusted direct compensation in thousands of 2014 GBPs (source: Boardex UK).
CEO equity-based compensation	Log of one plus the CEO's inflation-adjusted equity-based compensation in thousands of 2014 GBPs (source: Boardex UK).
CEO delta	Log of one plus the change in the CEO's inflation-adjusted wealth in the firm in thousands of 2014 GBPs for each 1% change in the stock price (source: Boardex UK).
Degree of directors from the same industry and year	Average *Normalized degree* for directors that belong to the same industry and year as the focal firm, excluding the firm's CEO (source: Boardex UK).
High institutional ownership	Binary variable that equals one if the fraction of shares outstanding held by institutional investors is higher than or equal to the sample median, and zero otherwise (source: Refinitiv Eikon).
Ownership of other institutions	Percentage of shares held by institutions that are not classified as institutional investors (source: Refinitiv Eikon).
Ownership of individuals	Percentage of shares held by individuals (source: Refinitiv Eikon).
Dummy institutional blockholder	Binary variable that equals one if there is at least one institutional investor with a holding of 5% or more, and zero otherwise (source: Refinitiv Eikon).
Dummy blockholder	Binary variable that equals one if there is at least one non–individual investor (i.e., a legal entity) with a holding of 5% or more, and zero otherwise (source: Refinitiv Eikon).
Days with repurchases before EPS announcement	Number of days with repurchase transactions carried out over the period before the EPS announcement (sources: Company REFS and IBES).
CEO net sales over months –1 to +1	Binary variable that equals one if the CEO is a net seller of her firm's shares between month –1 and month +1 around a repurchase date, and zero otherwise (source: Company REFS).
CEO net sales over month +1	Binary variable that equals one if the CEO is a net seller of her firm's shares over month +1 after a repurchase date, and zero otherwise (source: Company REFS).

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Figure 1. Number of repurchase transactions and stocks bought back over time

This graph shows the total number of repurchase transactions by calendar year in the initial dataset as well as in the final dataset used in the empirical analyses. It also reports the number of distinct stocks that are bought back by calendar year in the initial dataset.

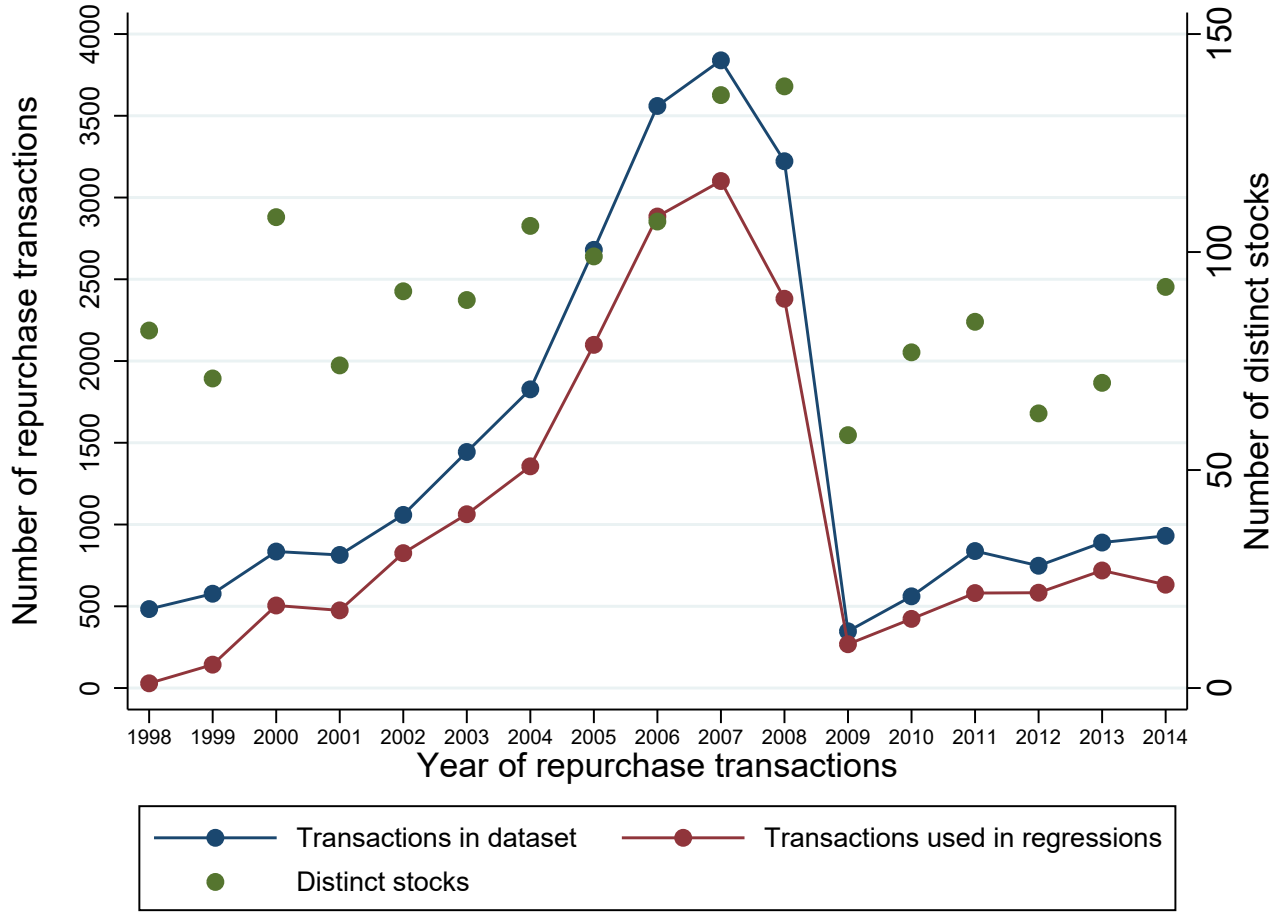

Table 1. Summary statistics

This table reports summary statistics for our main variables and for the sample used in the baseline regression analyses. This sample comprises 18,067 daily observations on open market repurchase transactions executed by 335 UK listed companies. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix.

	n	mean	p25	p50	p75	sd	min	max
Relative price -1 to +1	18,067	0.0001	-0.0223	-0.0029	0.0161	0.0630	-0.1532	0.4665
Relative price -3 to +3	18,067	-0.0018	-0.0383	-0.0027	0.0284	0.0772	-0.2170	0.4438
Relative price -6 to +6	18,067	-0.0046	-0.0498	-0.0058	0.0359	0.0924	-0.2723	0.4607
Relative price 0 to +1	18,067	0.0010	-0.0317	-0.0071	0.0202	0.0793	-0.1708	0.5607
Relative price 0 to +3	18,067	0.0010	-0.0584	-0.0158	0.0317	0.1336	-0.2340	0.9674
Relative price 0 to +6	18,067	-0.0040	-0.0884	-0.0304	0.0384	0.1697	-0.2942	1.0871
Relative price -1 to +1 dummy	18,067	0.5445	0	1	1	0.4980	0	1
Relative price -3 to +3 dummy	18,067	0.5241	0	1	1	0.4994	0	1
Relative price -6 to +6 dummy	18,067	0.5358	0	1	1	0.4987	0	1
Relative price 0 to +1 dummy	18,067	0.5780	0	1	1	0.4939	0	1
Relative price 0 to +3 dummy	18,067	0.5987	0	1	1	0.4902	0	1
Relative price 0 to +6 dummy	18,067	0.6273	0	1	1	0.4835	0	1
Degree	18,067	304.5535	45	164	390	424.5032	2	2455
Normalized degree	18,067	0.0011	0.0002	0.0005	0.0013	0.0016	0.0000	0.0081
Number of repurchase transactions	18,067	11.7642	6	12	17	6.2509	1	23
Log market capitalization	18,067	15.1361	13.6479	15.1038	17.2895	2.4086	8.8371	18.8556
Operating profits	18,067	0.1409	0.0819	0.1292	0.1813	0.0823	-0.0616	0.3577
Market-to-book	18,067	1.6607	0.9341	1.4150	2.2083	0.9528	0.2966	4.4535
Leverage	18,067	0.6129	0.4837	0.6229	0.7155	0.2073	0.0852	1.3455
Cash holdings	18,067	0.1097	0.0461	0.0817	0.1508	0.0935	0.0009	0.4892
Capex	18,067	0.0471	0.0203	0.0361	0.0679	0.0356	0.0018	0.1592
Dividend yield	18,067	0.0351	0.0214	0.0326	0.0421	0.0240	0.0000	0.1588
Turnover	18,067	0.0972	0.0613	0.0706	0.1315	0.0693	0.0014	0.3596
Volatility	18,067	295.2286	210.4167	265.6667	337.1667	117.2028	140.4167	699.1667
Male CEO	18,067	0.9614	1	1	1	0.1927	0	1
CEO age	18,067	51.9604	48	52	57	6.7741	31	87
CEO tenure	18,067	5.9111	2.0000	4.6000	7.2000	5.5784	0	50
CEO direct compensation	18,067	7.0636	6.6372	7.2546	7.8484	1.3124	0	8.6091
CEO equity-based compensation	18,067	6.3910	5.8684	7.2569	8.4299	2.9641	0	9.9391
CEO delta	18,067	4.5746	3.4341	4.5458	5.8599	1.7110	0	7.8709

Table 2. Correlation analysis

This table reports the cross–correlations for our main independent variables and for the sample used in the baseline regression analyses. This sample comprises 18,067 daily observations on open market repurchase transactions executed by 335 UK listed companies. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Normalized degree	1																
(2) Number of repurchase transactions	0.24	1															
(3) Log market capitalization	0.54	0.48	1														
(4) Operating profits	0.08	0.07	0.34	1													
(5) Market-to-book	0.11	0.07	0.41	0.75	1												
(6) Leverage	-0.02	0.11	0.17	0.28	0.10	1											
(7) Cash holdings	-0.08	-0.12	-0.17	0.07	0.24	-0.22	1										
(8) Capex	0.07	-0.01	0.13	0.33	0.14	0.12	-0.13	1									
(9) Dividend yield	-0.07	0.00	-0.10	-0.07	-0.29	0.18	-0.11	0.03	1								
(10) Turnover	-0.13	0.22	0.02	0.01	-0.02	0.17	-0.16	0.05	0.02	1							
(11) Volatility	-0.25	-0.32	-0.62	-0.28	-0.22	-0.27	0.30	-0.10	-0.13	-0.07	1						
(12) Male CEO	0.05	-0.03	0.04	-0.08	-0.05	0.06	0.02	-0.01	0.06	-0.17	0.03	1					
(13) CEO age	0.18	-0.02	0.13	-0.08	-0.03	-0.04	0.08	-0.02	-0.04	-0.29	-0.03	0.07	1				
(14) CEO tenure	0.08	-0.05	-0.12	-0.16	-0.15	0.02	-0.03	-0.05	-0.12	-0.13	0.08	0.10	0.39	1			
(15) CEO direct compensation	0.36	0.34	0.65	0.21	0.24	0.21	-0.20	0.07	-0.00	0.04	-0.51	-0.08	0.13	0.01	1		
(16)CEO equity-based compensation	0.40	0.37	0.71	0.22	0.24	0.15	-0.21	0.04	-0.03	0.04	-0.48	-0.01	0.03	-0.08	0.62	1	
(17) CEO delta	0.42	0.30	0.68	0.31	0.39	0.13	-0.09	0.07	-0.20	-0.09	-0.40	0.07	0.19	0.22	0.45	0.61	1

Table 3. Relative repurchase price and CEO network centrality: baseline OLS model

This table contains ordinary least squares (OLS) estimates of the relationship between the relative price at which a stock is repurchased and CEO network centrality proxied by the *Normalized degree*. The relative repurchase price is computed as the relative difference between the repurchase price paid by the firm in a repurchase transaction and the average closing prices of the firm's stock during the following time windows: from one, three, or six months before the repurchase date to one, three or six months after this date and from the repurchase date to one, three or six months after the repurchase. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix. All our specifications include calendar month and two–digit SIC code industry fixed effects. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	(1) Relative price -1 to +1	(2) Relative price -3 to +3	(3) Relative price -6 to +6	(4) Relative price 0 to +1	(5) Relative price 0 to +3	(6) Relative price 0 to +6
Normalized degree	3.9401*	3.4272	2.2215	6.8679***	14.9786***	19.5985***
	(1.782)	(1.559)	(0.957)	(2.606)	(3.550)	(3.926)
Number of repurchase transactions	0.0022**	0.0024**	0.0029**	0.0025**	0.0044**	0.0056**
	(2.022)	(2.280)	(2.514)	(2.029)	(2.065)	(2.328)
Log market capitalization	-0.0079	-0.0076	-0.0081	-0.0094	-0.0186*	-0.0266**
	(-1.433)	(-1.414)	(-1.424)	(-1.445)	(-1.700)	(-2.108)
Operating profits	0.0518	0.0583	0.1036*	0.0907*	0.1156	0.1305
	(1.222)	(1.243)	(1.705)	(1.824)	(1.166)	(1.003)
Market-to-book	-0.0021	0.0004	0.0001	-0.0075	-0.0085	-0.0109
	(-0.413)	(0.068)	(0.012)	(-1.411)	(-0.998)	(-0.969)
Leverage	-0.0255	-0.0314	-0.0505*	-0.0366	-0.0578	-0.0682
	(-1.013)	(-1.241)	(-1.779)	(-1.208)	(-1.154)	(-1.169)
Cash holdings	-0.0589	-0.0777	-0.0881	-0.0597	-0.1026	-0.1272
	(-1.171)	(-1.522)	(-1.560)	(-0.996)	(-1.010)	(-1.081)
Capex	-0.0278	-0.0798	-0.1130	-0.0000	0.0389	0.0362
	(-0.552)	(-1.268)	(-1.206)	(-0.000)	(0.301)	(0.196)
Dividend yield	-0.0134	0.0017	-0.0213	0.0255	0.2096	0.2732
	(-0.221)	(0.022)	(-0.169)	(0.331)	(1.193)	(0.998)
Turnover	-0.0043	-0.0270	-0.0645	0.0821	0.1935	0.3656**
	(-0.062)	(-0.408)	(-0.968)	(1.062)	(1.585)	(2.098)
Volatility	-0.0000	-0.0000	-0.0000	-0.0000	-0.0001	-0.0001
	(-1.129)	(-1.092)	(-0.562)	(-1.201)	(-1.176)	(-0.910)
Male CEO	-0.0039	-0.0131	-0.0247*	-0.0134	-0.0322	-0.0652
	(-0.515)	(-1.419)	(-1.897)	(-1.302)	(-1.339)	(-1.417)
CEO age	-0.0014	-0.0013	-0.0012	-0.0017	-0.0031	-0.0028
	(-1.324)	(-1.279)	(-1.128)	(-1.369)	(-1.481)	(-1.199)
CEO tenure	0.0012	0.0014*	0.0018**	0.0015	0.0033**	0.0043**
	(1.463)	(1.747)	(2.014)	(1.569)	(2.006)	(2.164)
CEO direct compensation	0.0019	0.0013	0.0022	0.0025	0.0026	0.0040
	(0.775)	(0.517)	(0.761)	(0.866)	(0.489)	(0.590)
CEO equity-based compensation	-0.0023	-0.0023	-0.0022	-0.0033	-0.0058	-0.0068
	(-1.184)	(-1.161)	(-1.040)	(-1.463)	(-1.580)	(-1.576)
CEO delta	0.0033	0.0014	0.0006	0.0031	0.0017	-0.0010
	(1.106)	(0.452)	(0.184)	(0.859)	(0.283)	(-0.141)
Constant	0.1660	0.2208*	0.2486*	0.1677	0.4096	0.5708*
	(1.291)	(1.768)	(1.886)	(1.104)	(1.590)	(1.936)
Observations	18,067	18,067	18,067	18,067	18,067	18,067
Adjusted R-squared	0.208	0.233	0.260	0.262	0.336	0.388
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes	Yes	Yes	Yes

Table 4. Relative repurchase price dummy and CEO network centrality: LPM model

This table contains linear probability model (LPM) estimates of the relationship between a binary variable based on the relative price at which a stock is repurchased and CEO network centrality proxied by the *Normalized degree*. The relative repurchase price dummy is equal to one when the relative repurchase price is negative, and zero otherwise. The relative repurchase price is computed as the relative difference between the repurchase price paid by the firm in a repurchase transaction and the average closing prices of the firm's stock during the following time windows: from one, three, or six months before the repurchase date to one, three or six months after this date and from the repurchase date to one, three or six months after the repurchase. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix. All our specifications include calendar month and two–digit SIC code industry fixed effects. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	(1) Relative price -1 to +1 dummy	(2) Relative price -3 to +3 dummy	(3) Relative price -6 to +6 dummy	(4) Relative price 0 to +1 dummy	(5) Relative price 0 to +3 dummy	(6) Relative price 0 to +6 dummy
Normalized degree	-13.5957*	-20.9701***	-16.0993*	-21.1583**	-20.5469**	-41.7960***
	(-1.926)	(-2.600)	(-1.756)	(-2.455)	(-2.080)	(-3.555)
Number of repurchase transactions	-0.0085***	-0.0073***	-0.0071***	-0.0083***	-0.0059***	-0.0061***
	(-5.030)	(-3.419)	(-3.344)	(-4.789)	(-2.930)	(-2.940)
Log market capitalization	0.0088	0.0121	0.0152	0.0081	0.0116	0.0232
	(1.036)	(1.251)	(1.380)	(0.815)	(0.949)	(1.526)
Operating profits	-0.0816	-0.1905	-0.4736*	-0.3368*	-0.3630	-0.4359
	(-0.469)	(-0.944)	(-1.723)	(-1.806)	(-1.384)	(-1.166)
Market-to-book	0.0181	0.0079	0.0289	0.0404**	0.0619**	0.1007***
	(0.852)	(0.317)	(0.900)	(2.032)	(2.548)	(3.143)
Leverage	0.0202	0.0287	0.1383*	0.0341	0.0091	-0.0248
	(0.391)	(0.432)	(1.687)	(0.587)	(0.124)	(-0.278)
Cash holdings	0.0858	0.2005*	0.1665	0.0212	0.0459	0.0696
	(0.852)	(1.724)	(1.118)	(0.179)	(0.318)	(0.401)
Capex	-0.1472	0.0691	-0.0530	-0.4203	-0.0041	-0.3339
	(-0.568)	(0.200)	(-0.114)	(-1.311)	(-0.010)	(-0.638)
Dividend yield	-0.1124	0.2294	0.7015	-0.2487	-0.8158**	-0.7006
	(-0.365)	(0.553)	(1.241)	(-0.781)	(-2.023)	(-1.400)
Turnover	-0.0226	0.1238	-0.0295	-0.5373***	-0.9380***	-1.1090***
	(-0.121)	(0.556)	(-0.130)	(-2.838)	(-3.563)	(-4.070)
Volatility	-0.0000	0.0001	0.0001	-0.0001	0.0002	0.0002
	(-0.040)	(0.553)	(0.751)	(-0.523)	(1.309)	(1.579)
Male CEO	0.0820**	0.1072***	0.0945**	0.0162	-0.0215	-0.0483
	(2.006)	(3.333)	(2.036)	(0.306)	(-0.275)	(-0.573)
CEO age	0.0001	0.0019	0.0012	0.0004	-0.0017	-0.0035
	(0.065)	(1.010)	(0.630)	(0.199)	(-0.850)	(-1.477)
CEO tenure	0.0013	0.0001	-0.0025	-0.0025	-0.0030	-0.0017
	(0.818)	(0.026)	(-0.907)	(-1.232)	(-1.238)	(-0.666)
CEO direct compensation	-0.0033	-0.0007	-0.0078	0.0011	0.0126	0.0084
	(-0.445)	(-0.085)	(-0.891)	(0.134)	(1.359)	(0.700)
CEO equity-based compensation	0.0076**	0.0096**	0.0106**	0.0071*	0.0104*	0.0107*
	(2.036)	(2.163)	(1.977)	(1.804)	(1.842)	(1.679)
CEO delta	-0.0109*	0.0034	0.0007	0.0008	0.0100	0.0137
	(-1.654)	(0.411)	(0.069)	(0.086)	(0.888)	(1.211)

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Constant	0.9014***	-0.5892**	-0.5156*	0.9955***	0.8080***	0.7394***
	(4.902)	(-2.358)	(-1.861)	(4.812)	(3.335)	(2.726)
Observations	18,067	18,067	18,067	18,067	18,067	18,067
Adjusted R-squared	0.094	0.161	0.179	0.162	0.260	0.329
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes	Yes	Yes	Yes

Table 5. Relative repurchase price and CEO network centrality: alternative clustering

This table contains regressions that replicate the baseline analyses presented in columns (4)–(6) of Table 3 but use alternative clustering of the standard errors. Columns (1), (3), and (5) use heteroskedasticity–robust standard errors clustered at the firm level while columns (2), (4), and (6) use double clustering by both CEO and calendar month of the repurchase transaction. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix. All our specifications include calendar month and two–digit SIC code industry fixed effects. *t-statistics* are in parentheses. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	(1) Relative price 0 to +1	(2) Relative price 0 to +1	(3) Relative price 0 to +3	(4) Relative price 0 to +3	(5) Relative price 0 to +6	(6) Relative price 0 to +6
Normalized degree	6.8679**	6.8679***	14.9786***	14.9786***	19.5985***	19.5985***
	(2.389)	(2.683)	(3.115)	(3.379)	(3.875)	(3.824)
Number of repurchase transactions	0.0025**	0.0025**	0.0044**	0.0044**	0.0056**	0.0056**
	(2.025)	(2.000)	(2.058)	(2.018)	(2.313)	(2.281)
Log market capitalization	-0.0094	-0.0094	-0.0186*	-0.0186*	-0.0266**	-0.0266**
	(-1.428)	(-1.465)	(-1.677)	(-1.726)	(-2.077)	(-2.122)
Operating profits	0.0907*	0.0907*	0.1156	0.1156	0.1305	0.1305
	(1.829)	(1.778)	(1.184)	(1.067)	(1.012)	(0.906)
Market-to-book	-0.0075	-0.0075	-0.0085	-0.0085	-0.0109	-0.0109
	(-1.424)	(-1.393)	(-1.005)	(-0.977)	(-0.958)	(-0.927)
Leverage	-0.0366	-0.0366	-0.0578	-0.0578	-0.0682	-0.0682
	(-1.182)	(-1.210)	(-1.121)	(-1.136)	(-1.118)	(-1.141)
Cash holdings	-0.0597	-0.0597	-0.1026	-0.1026	-0.1272	-0.1272
	(-0.988)	(-0.999)	(-1.000)	(-1.007)	(-1.071)	(-1.070)
Capex	-0.0000	-0.0000	0.0389	0.0389	0.0362	0.0362
	(-0.000)	(-0.000)	(0.296)	(0.295)	(0.191)	(0.195)
Dividend yield	0.0255	0.0255	0.2096	0.2096	0.2732	0.2732
	(0.332)	(0.302)	(1.219)	(1.073)	(1.003)	(0.933)
Turnover	0.0821	0.0821	0.1935	0.1935	0.3656**	0.3656*
	(1.047)	(0.969)	(1.563)	(1.445)	(2.078)	(1.959)
Volatility	-0.0000	-0.0000	-0.0001	-0.0001	-0.0001	-0.0001
	(-1.190)	(-1.141)	(-1.170)	(-1.188)	(-0.906)	(-0.985)
Male CEO	-0.0134	-0.0134	-0.0322	-0.0322	-0.0652	-0.0652
	(-1.295)	(-1.435)	(-1.357)	(-1.312)	(-1.425)	(-1.379)
CEO age	-0.0017	-0.0017	-0.0031	-0.0031	-0.0028	-0.0028
	(-1.366)	(-1.360)	(-1.478)	(-1.448)	(-1.194)	(-1.183)
CEO tenure	0.0015	0.0015	0.0033**	0.0033*	0.0043**	0.0043**
	(1.558)	(1.545)	(1.982)	(1.941)	(2.123)	(2.143)
CEO direct compensation	0.0025	0.0025	0.0026	0.0026	0.0040	0.0040
	(0.868)	(0.876)	(0.496)	(0.498)	(0.598)	(0.607)
CEO equity-based compensation	-0.0033	-0.0033	-0.0058	-0.0058	-0.0068	-0.0068
	(-1.458)	(-1.457)	(-1.579)	(-1.573)	(-1.579)	(-1.571)
CEO delta	0.0031	0.0031	0.0017	0.0017	-0.0010	-0.0010
	(0.816)	(0.869)	(0.268)	(0.291)	(-0.133)	(-0.144)
Constant	0.1677	0.2222	0.4096	0.4389*	0.5708*	0.5483*
	(1.101)	(1.448)	(1.584)	(1.716)	(1.926)	(1.891)
Observations	18,067	18,067	18,067	18,067	18,067	18,067
Adjusted R-squared	0.262	0.262	0.336	0.336	0.388	0.388
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm clustering	Yes	No	Yes	No	Yes	No
CEO clustering	No	Yes	No	Yes	No	Yes
Month clustering	No	Yes	No	Yes	No	Yes

Table 6. Relative repurchase price and alternative definitions of network centrality

This table contains regressions that replicate the baseline analyses presented in columns (4)–(6) of Table 3 but use alternative definitions of CEO network centrality. *Percentile of degree* is the value of the percentile of a CEO's degree based on the distribution of degree for all the executives and directors of UK public companies. *Normalized degree – Active ties* is a CEO's *Normalized degree* only based on connections that have been active in the past five years. *Normalized degree – Stable ties* is a CEO's *Normalized degree* only based on connections that last for at least three years. *Normalized closeness* is the inverse of the average distance between a CEO and any other individual in the network. *Normalized betweenness* is the number of shortest paths connecting two individuals in the networks that go through the CEO. *Normalized eigenvector* is the number of CEO connections that are weighted by their relative centrality. All our specifications include the control variables of Table 3 together with calendar month and two–digit SIC code industry fixed effects. Detailed variable definitions can be found in the Appendix. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	Percentile of degree	Normalized degree – Active ties	Normalized degree – Stable ties	Normalized closeness	Normalized between-ness	Normalized eigenvec-tor	Adjusted R–squared
Dependent variable:							
(1) Relative price 0 to +1	0.0013*						0.272
	(1.842)						
(2) Relative price 0 to +3	0.0022*						0.343
	(1.946)						
(3) Relative price 0 to +6	0.0023*						0.390
	(1.804)						
(4) Relative price 0 to +1		11.6260**					0.266
		(2.306)					
(5) Relative price 0 to +3		22.663***					0.339
		(2.676)					
(6) Relative price 0 to +6		31.2652***					0.392
		(3.291)					
(7) Relative price 0 to +1			6.3711**				0.265
			(2.164)				
(8) Relative price 0 to +3			13.6802***				0.328
			(2.869)				
(9) Relative price 0 to +6			19.2358***				0.379
			(3.337)				
(10) Relative price 0 to +1				360.8803***			0.259
				(4.415)			
(11) Relative price 0 to +3				615.6788***			0.330
				(4.297)			
(12) Relative price 0 to +6				747.3142***			0.381
				(4.540)			
(13) Relative price 0 to +1					10.2541**		0.261
					(2.537)		
(14) Relative price 0 to +3					22.9939***		0.334
					(3.142)		
(15) Relative price 0 to +6					35.9961***		0.388
					(4.082)		
(16) Relative price 0 to +1						-0.2364	0.259
						(-0.112)	
(17) Relative price 0 to +3						1.1887	0.330
						(0.327)	
(18) Relative price 0 to +6						1.3965	0.381
						(0.308)	

Table 7. Relative repurchase price and CEO network centrality: datasets based on alternative definitions of CEO

This table contains regressions that replicate the baseline analyses presented in columns (4)–(6) of Table 3 but use datasets based on alternative definitions of CEO. In the first three regressions, we drop observations for firms with multiple CEOs. In the second three, we drop observations for firms without any executive with an explicit "CEO" title. All our specifications include the control variables of Table 3 together with calendar month and two–digit SIC code industry fixed effects. Detailed variable definitions can be found in the Appendix. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	Normalized degree - No multiple CEOs	Normalized degree - Strict CEO definition	Adjusted R-squared
Dependent variable:			
(1) Relative price 0 to +1	7.2501***		0.274
	(2.663)		
(2) Relative price 0 to +3	15.9350***		0.350
	(3.686)		
(3) Relative price 0 to +6	20.7144***		0.403
	(3.952)		
(4) Relative price 0 to +1		7.1058**	0.287
		(2.572)	
(5) Relative price 0 to +3		15.4547***	0.361
		(3.369)	
(6) Relative price 0 to +6		19.7997***	0.414
		(3.771)	

Table 8. Relative repurchase price and CEO network centrality: CEO turnover events

This table contains regressions that replicate the baseline analyses presented in columns (4)–(6) of Table 3 but only use repurchase transactions that take place around a CEO turnover event. Events that are not both followed and preceded by buyback transactions are discarded. In models (1), (2), and (3) transactions that take place over the two–year period around the turnover date (31 turnovers) are considered. In model (4), (5), and (6) transactions that happen during the two years before and the two years after the turnover date (34 turnovers) are used. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix. All our specifications include turnover fixed effects. *t-statistics* are in parentheses. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	(1) Relative price 0 to +1	(2) Relative price 0 to +3	(3) Relative price 0 to +6	(4) Relative price 0 to +1	(5) Relative price 0 to +3	(6) Relative price 0 to +6
Normalized degree	6.3364***	13.5867***	11.4939***	1.8789	5.8810***	11.0653***
	(3.905)	(5.784)	(4.149)	(1.586)	(3.337)	(5.278)
Number of repurchase transactions	0.0013***	0.0021***	0.0037***	0.0006***	0.0013***	0.0024***
	(5.619)	(6.159)	(9.140)	(3.465)	(4.880)	(7.238)
Log market capitalization	0.0245	0.0631**	-0.1528***	-0.0307***	-0.1016***	-0.2229***
	(1.132)	(2.010)	(-4.129)	(-2.581)	(-5.747)	(-10.597)
Operating profits	-0.0535	-0.1064	0.5999***	0.0438	0.0281	0.3455***
	(-0.641)	(-0.881)	(4.211)	(1.039)	(0.449)	(4.639)
Market-to-book	-0.0162	-0.0496***	-0.0210	-0.0146***	-0.0235***	-0.0337***
	(-1.311)	(-2.780)	(-0.999)	(-2.669)	(-2.891)	(-3.478)
Leverage	-0.0653	-0.1565**	-0.2295***	0.0011	-0.0296	-0.0371
	(-1.544)	(-2.556)	(-3.178)	(0.048)	(-0.886)	(-0.932)
Cash holdings	-0.2458**	-0.4270***	-0.7021***	-0.1168***	-0.2139***	-0.3421***
	(-2.221)	(-2.666)	(-3.716)	(-2.696)	(-3.320)	(-4.463)
Capex	-0.0072	0.5210	-1.6720***	0.1237	0.1546	-0.0947
	(-0.028)	(1.394)	(-3.794)	(0.966)	(0.811)	(-0.418)
Dividend yield	1.2649**	2.4836***	0.7033	-0.0124	0.4535	-0.1150
	(2.262)	(3.068)	(0.737)	(-0.054)	(1.332)	(-0.284)
Turnover	-0.2131**	-0.3952***	-0.2523	0.0219	-0.0899	-0.3102***
	(-2.361)	(-3.026)	(-1.638)	(0.435)	(-1.203)	(-3.488)
Volatility	-0.0000	-0.0001	-0.0003**	-0.0001*	-0.0004***	-0.0007***
	(-0.225)	(-0.870)	(-2.169)	(-1.774)	(-5.229)	(-8.846)
Male CEO	-0.0113	-0.0130	-0.0141	-0.0281***	-0.0536***	-0.0511***
	(-1.055)	(-0.840)	(-0.772)	(-3.974)	(-5.093)	(-4.081)
CEO age	0.0010*	0.0022**	0.0020**	0.0018***	0.0046***	0.0049***
	(1.775)	(2.537)	(1.965)	(4.247)	(7.261)	(6.428)
CEO tenure	-0.0020***	-0.0064***	-0.0031**	-0.0028***	-0.0081***	-0.0085***
	(-2.677)	(-5.921)	(-2.426)	(-5.623)	(-10.838)	(-9.560)
CEO direct compensation	-0.0105**	-0.0171***	-0.0251***	-0.0178***	-0.0406***	-0.0546***
	(-2.405)	(-2.700)	(-3.368)	(-4.796)	(-7.361)	(-8.324)
CEO equity-based compensation	0.0005	0.0006	-0.0009	-0.0002	0.0004	-0.0021
	(0.486)	(0.389)	(-0.447)	(-0.270)	(0.350)	(-1.440)
CEO delta	-0.0034	0.0050	-0.0131**	0.0056***	0.0171***	0.0107***
	(-1.013)	(1.032)	(-2.287)	(3.289)	(6.740)	(3.550)
Constant	-0.2905	-0.8678	2.9470***	0.5867***	1.8617***	4.1110***
	(-0.792)	(-1.634)	(4.706)	(2.877)	(6.139)	(11.394)
Observations	2,101	2,101	2,101	3,509	3,509	3,509
Adjusted R-squared	0.022	0.075	0.167	0.066	0.185	0.283
Turnover FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 9. Relative repurchase price and CEO network centrality: IV regressions

This table contains instrumental variable (IV) regression estimates of the relationship between the relative price at which a stock is repurchased and CEO network centrality proxied by the *Normalized degree*. The relative repurchase price is computed as the relative difference between the repurchase price paid by the firm in a repurchase transaction and the average closing prices of the firm's stock during the following time windows: from the repurchase date to one, three or six months after the repurchase. The instrumental variable *Degree of directors from the same industry and year* is the average *Normalized degree* for directors that belong to the same two–digit SIC code industry and year as the focal firm, excluding the firm's CEO. Column (1) contains the coefficients of the first stage regression, while columns (2), (3), and (4) report coefficients of the second stage in which the dependent variable is the relative repurchase price. All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix. All our specifications include calendar month and two–digit SIC code industry fixed effects. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	(1) Normalized degree	(2) Relative price 0 to +1	(3) Relative price 0 to +3	(4) Relative price 0 to +6
Normalized degree		7.2651*	14.1762**	22.2064***
		(1.683)	(2.002)	(2.691)
Number of repurchase transactions	-0.0000	0.0025**	0.0044**	0.0056**
	(-0.404)	(2.048)	(2.085)	(2.350)
Log market capitalization	0.0001***	-0.0094	-0.0185*	-0.0268**
	(3.226)	(-1.452)	(-1.696)	(-2.133)
Operating profits	0.0008	0.0905*	0.1161	0.1288
	(0.883)	(1.846)	(1.185)	(0.998)
Market-to-book	0.0001	-0.0075	-0.0083	-0.0113
	(0.874)	(-1.415)	(-0.985)	(-1.015)
Leverage	-0.0001	-0.0365	-0.0580	-0.0677
	(-0.495)	(-1.220)	(-1.170)	(-1.176)
Cash holdings	0.0007	-0.0599	-0.1024	-0.1280
	(1.641)	(-1.004)	(-1.013)	(-1.093)
Capex	-0.0024**	0.0017	0.0355	0.0472
	(-2.136)	(0.024)	(0.267)	(0.252)
Dividend yield	-0.0005	0.0259	0.2087	0.2761
	(-0.401)	(0.339)	(1.194)	(1.016)
Turnover	-0.0016***	0.0822	0.1933	0.3662**
	(-2.694)	(1.072)	(1.599)	(2.116)
Volatility	0.0000***	-0.0000	-0.0001	-0.0001
	(2.856)	(-1.211)	(-1.176)	(-0.940)
Male CEO	-0.0003	-0.0132	-0.0324	-0.0645
	(-1.098)	(-1.280)	(-1.358)	(-1.393)
CEO age	0.0000***	-0.0017	-0.0031	-0.0029
	(2.868)	(-1.377)	(-1.472)	(-1.222)
CEO tenure	-0.0000	0.0015	0.0033**	0.0042**
	(-0.605)	(1.588)	(2.040)	(2.178)
CEO direct compensation	0.0001***	0.0025	0.0027	0.0038
	(3.631)	(0.864)	(0.506)	(0.560)
CEO equity-based compensation	0.0000	-0.0033	-0.0058	-0.0068
	(0.813)	(-1.471)	(-1.578)	(-1.599)
CEO delta	0.0000	0.0031	0.0017	-0.0010
	(1.252)	(0.867)	(0.286)	(-0.142)
Degree of directors from the same industry and year	4.1609***			
	(5.840)			

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Observations	18,067	18,067	18,067	18,067
R-squared		0.083	0.117	0.141
Industry FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes	Yes
Underidentification test (Kleibergen-Paap rk LM statistic)	4.281			
Underidentification test p-value	0.0385			
Weak identification test (Cragg-Donald Wald F statistic)	8,611			
Weak identification test (Kleibergen-Paap rk Wald F statistic)	34.11			

Table 10. Relative repurchase price, CEO network centrality, and ownership

This table contains regressions that extend the baseline analyses presented in columns (4)–(6) of Table 3 by testing whether the relationship between the relative repurchase price and a CEO's professional network is affected by corporate ownership. Ownership variables are interacted with the dummy *High normalized degree* that equals one for above–median values of *Normalized degree* or values equal to the median while some further ownership variables are used as additional controls. *High institutional ownership* is equal to one if the fraction of shares outstanding held by institutional investors is higher than or equal to the sample median, and zero otherwise. *Dummy institutional blockholder* is equal to one if there is at least one institutional investor with a holding of 5% or more, and zero otherwise. *Dummy blockholder* is equal to one if there is at least one non–individual investor (i.e., institutional investor or any other type of legal entity) with a holding of 5% or more, and zero otherwise. *Ownership of other institutions* (*Ownership of individuals*) is the percentage of shares held by institutions that are not classified as institutional investors (individuals). All our specifications include the control variables of Table 3 together with calendar month and two–digit SIC code industry fixed effects. Detailed variable definitions can be found in the Appendix. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

Panel A. Tests based on ownership of financial institutions

	(1) Relative price 0 to +1	(2) Relative price 0 to +3	(3) Relative price 0 to +6
High normalized degree	0.0154**	0.0290*	0.0330*
	(2.097)	(1.956)	(1.709)
High institutional ownership	0.0115	0.0224*	0.0281
	(1.604)	(1.665)	(1.519)
High normalized degree *			
High institutional ownership	-0.0149*	-0.0334**	-0.0499**
	(-1.780)	(-2.007)	(-2.150)
Ownership of other institutions	-0.0004	-0.0005	-0.0006
	(-1.052)	(-0.687)	(-0.638)
Ownership of individuals	0.0000	0.0001	0.0001
	(0.059)	(0.425)	(0.210)
Observations	18,067	18,067	18,067
Adjusted R-squared	0.261	0.333	0.384
Control variables	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes

Panel B. Tests based on presence of institutional blockholders (with 5% or higher holdings)

	(1) Relative price 0 to +1	(2) Relative price 0 to +3	(3) Relative price 0 to +6
High normalized degree	0.0302**	0.0528**	0.0644**
	(2.256)	(2.239)	(2.266)
Dummy institutional blockholder	0.0214	0.0364	0.0436
	(1.521)	(1.482)	(1.527)
High normalized degree *			
Dummy institutional blockholder	-0.0285	-0.0533*	-0.0761**
	(-1.606)	(-1.712)	(-2.088)
Ownership of other institutions	-0.0004	-0.0004	-0.0005
	(-1.050)	(-0.648)	(-0.596)
Ownership of individuals	0.0000	0.0002	0.0001
	(0.171)	(0.567)	(0.376)
Observations	18,067	18,067	18,067
Adjusted R-squared	0.263	0.334	0.386
Control variables	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes

Panel C. Tests based on presence of institutional or corporate blockholders (with 5% or higher holdings)

	(1) Relative price 0 to +1	(2) Relative price 0 to +3	(3) Relative price 0 to +6
High normalized degree	0.0305**	0.0672***	0.0851***
	(2.384)	(3.064)	(3.153)
Dummy blockholder	0.0264*	0.0573**	0.0695**
	(1.795)	(2.330)	(2.430)
High normalized degree *			
Dummy blockholder	-0.0269*	-0.0649**	-0.0930***
	(-1.713)	(-2.426)	(-2.911)
Ownership of individuals	0.0000	0.0002	0.0002
	(0.062)	(0.557)	(0.407)
Observations	18,067	18,067	18,067
Adjusted R-squared			
Control variables	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes

Table 11. Relative repurchase price, CEO network centrality, and the network centrality of other directors

This table contains regressions that replicate the baseline analyses presented in columns (4)–(6) of Table 3 but also control for the average *Normalized degree* of non–CEO directors of the focal firm, distinguishing between all directors (*Degree of other directors*) and executive directors (*Degree of other executive directors*). All variables except the binary variables, the *Number of repurchase transactions*, *CEO age*, and *CEO tenure* are winsorized at the 1% level. Detailed variable definitions can be found in the Appendix. All our specifications include calendar month and two–digit SIC code industry fixed effects. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

	(1) Relative price 0 to +1	(2) Relative price 0 to +1	(3) Relative price 0 to +3	(4) Relative price 0 to +3	(5) Relative price 0 to +6	(6) Relative price 0 to +6
Normalized degree	7.0574**	7.2706**	15.0007***	15.7425***	18.0727***	20.4931***
	(2.483)	(2.562)	(3.242)	(3.435)	(3.258)	(3.749)
Degree of other directors	-1.7853		-0.2078		14.3746	
	(-0.202)		(-0.013)		(0.714)	
Degree of other executive directors		1.5204		4.4974		11.9684
		(0.249)		(0.359)		(0.685)
Number of repurchase transactions	0.0025**	0.0025**	0.0044**	0.0044**	0.0055**	0.0055**
	(2.037)	(2.043)	(2.065)	(2.068)	(2.294)	(2.311)
Log market capitalization	-0.0091	-0.0091	-0.0185	-0.0172	-0.0289**	-0.0248*
	(-1.369)	(-1.364)	(-1.642)	(-1.537)	(-2.209)	(-1.938)
Operating profits	0.0902*	0.0895*	0.1155	0.1148	0.1349	0.1316
	(1.810)	(1.809)	(1.166)	(1.168)	(1.043)	(1.018)
Market-to-book	-0.0075	-0.0075	-0.0085	-0.0091	-0.0107	-0.0117
	(-1.412)	(-1.397)	(-0.996)	(-1.065)	(-0.965)	(-1.039)
Leverage	-0.0373	-0.0387	-0.0579	-0.0621	-0.0626	-0.0727
	(-1.220)	(-1.267)	(-1.147)	(-1.226)	(-1.062)	(-1.230)
Cash holdings	-0.0600	-0.0596	-0.1026	-0.1026	-0.1255	-0.1256
	(-1.000)	(-1.000)	(-1.011)	(-1.014)	(-1.067)	(-1.067)
Capex	0.0007	-0.0000	0.0389	0.0378	0.0308	0.0308
	(0.010)	(-0.000)	(0.300)	(0.296)	(0.166)	(0.166)
Dividend yield	0.0320	0.0191	0.2103	0.1827	0.2209	0.2171
	(0.443)	(0.250)	(1.201)	(1.063)	(0.804)	(0.810)
Turnover	0.0823	0.0854	0.1936	0.2080*	0.3638**	0.3867**
	(1.064)	(1.080)	(1.582)	(1.694)	(2.091)	(2.214)
Volatility	-0.0000	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(-1.221)	(-1.253)	(-1.189)	(-1.256)	(-0.859)	(-0.971)
Male CEO	-0.0138	-0.0114	-0.0323	-0.0269	-0.0617	-0.0564
	(-1.314)	(-1.152)	(-1.329)	(-1.249)	(-1.345)	(-1.362)
CEO age	-0.0017	-0.0017	-0.0031	-0.0031	-0.0027	-0.0027
	(-1.382)	(-1.356)	(-1.485)	(-1.465)	(-1.159)	(-1.155)
CEO tenure	0.0015	0.0015	0.0033**	0.0032*	0.0043**	0.0040**
	(1.566)	(1.515)	(2.004)	(1.927)	(2.173)	(2.052)
CEO direct compensation	0.0024	0.0014	0.0026	-0.0007	0.0046	-0.0012
	(0.845)	(0.445)	(0.489)	(-0.135)	(0.671)	(-0.171)
CEO equity-based compensation	-0.0033	-0.0033	-0.0058	-0.0062*	-0.0065	-0.0074*
	(-1.464)	(-1.529)	(-1.565)	(-1.721)	(-1.504)	(-1.767)
CEO delta	0.0031	0.0032	0.0017	0.0023	-0.0013	-0.0000
	(0.864)	(0.920)	(0.283)	(0.392)	(-0.173)	(-0.001)
Constant	0.1651	0.1703	0.4093	0.4133	0.5916**	0.5755*
	(1.080)	(1.118)	(1.572)	(1.599)	(1.980)	(1.948)
Observations	18,067	17,991	18,067	17,991	18,067	17,991
Adjusted R-squared	0.262	0.263	0.336	0.338	0.388	0.391
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes	Yes	Yes	Yes

Table 12. EPS surprise and repurchase transactions: univariate tests

The table reports *t-statistics* on the null hypothesis of equal mean in the number of days with repurchase transactions during various time windows before an end–of–year EPS announcement between firm–years with positive and negative EPS surprises. An EPS surprise is positive (negative) when the actual EPS announced by the firm is at least as large as (smaller than) the respective consensus average EPS forecast provided by analysts. Panel A reports the tests for the whole sample, while Panels B and C present the same tests for the two subsamples of firm–years with CEOs' normalized degrees higher than or equal to the sample median and lower than the sample median, respectively. Detailed variable definitions can be found in the Appendix. ***, ** and * denote significance at the 1, 5, and 10% level, respectively.

Panel A. Days with repurchase transactions before EPS announcements for positive and negative EPS surprises

	Postive surprise		Negative surprise		
	n	mean	n	mean	t-stat
Number of days with repurchases:					
From month -1 to the EPS announcement	1,761	0.3435	1,216	0.1982	2.04**
From month -2 to the EPS announcement	1,761	0.6962	1,216	0.3972	2.37**
From month -3 to the EPS announcement	1,761	1.3254	1,216	0.9531	1.94*
From month -6 to the EPS announcement	1,761	3.3032	1,216	2.5058	1.98**
From month -9 to the EPS announcement	1,761	4.6576	1,216	3.6439	1.80*
From month -12 to the EPS announcement	1,761	6.4770	1,216	5.2599	1.65*
From month -4 to month -6	1,761	1.9778	1,216	1.5526	1.67*
From month -7 to month -9	1,761	1.3543	1,216	1.1381	1.04
From month -10 to month -12	1,761	1.8194	1,216	1.6159	0.82

Panel B. Days with repurchase transactions before EPS announcements for positive and negative EPS surprises: sub-sample of high-degree CEOs

	Postive surprise		Negative surprise		
	n	mean	n	mean	t-stat
Number of days with repurchases:					
From month -1 to the EPS announcement	868	0.5910	621	0.2737	2.47**
From month -2 to the EPS announcement	868	1.1440	621	0.5604	2.61***
From month -3 to the EPS announcement	868	2.1256	621	1.4267	2.05**
From month -6 to the EPS announcement	868	5.2350	621	3.9211	1.81*
From month -9 to the EPS announcement	868	7.3468	621	5.7150	1.60
From month -12 to the EPS announcement	868	10.2650	621	8.2254	1.52
From month -4 to month -6	868	3.1094	621	2.4944	1.32
From month -7 to month -9	868	2.1117	621	1.7939	0.85
From month -10 to month -12	868	2.9182	621	2.5105	0.90

Panel C. Days with repurchase transactions before EPS announcements for positive and negative EPS surprises: sub-sample of low-degree CEOs

	Postive surprise		Negative surprise		
	n	mean	n	mean	t-stat
Number of days with repurchases:					
From month -1 to the EPS announcement	893	0.1030	595	0.1193	-0.27
From month -2 to the EPS announcement	893	0.2609	595	0.2269	0.30
From month -3 to the EPS announcement	893	0.5476	595	0.4588	0.52
From month -6 to the EPS announcement	893	1.4255	595	1.0286	1.24
From month -9 to the EPS announcement	893	2.0436	595	1.4823	1.30
From month -12 to the EPS announcement	893	2.7951	595	2.1647	1.16
From month -4 to month -6	893	0.8779	595	0.5697	1.64
From month -7 to month -9	893	0.6181	595	0.4538	0.97
From month -10 to month -12	893	0.7514	595	0.6823	0.40

Table 13. EPS surprise and repurchase transactions: multivariate tests

This table comprise multinomial logit regressions that examine the association between the number of days with repurchase transactions during periods preceding EPS announcements (over one, two or three months before) and outcomes based on intersections between the sign of a firm's EPS surprise and the firm's CEO's *Normalized degree*. An EPS surprise is positive (negative) when the actual EPS announced by the firm is at least as large as (smaller than) the respective consensus average EPS forecast provided by analysts. A high–degree (low–degree) CEO has a *Normalized degree* that is higher than or equal to (lower than) the sample median. The base case is the occurrence of a negative EPS surprise combined with the presence of a high–degree CEO. All our specifications include the control variables of Table 3 except the *Number of repurchase transactions*, *Turnover*, and *Volatiliy*. Detailed variable definitions are in the Appendix. *z-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

Panel A. Tests for number of days with repurchase transactions over the month before the EPS announcement

	(1) Negative surprise & Low-degree CEO	(2) Positive surprise & Low-degree CEO	(3) Positive surprise & High-degree CEO
Days with repurchases before EPS announcement	0.0330	0.0009	0.0439*
	(0.679)	(0.022)	(1.917)
Observations	2,997		
Pseudo R-squared	0.1421		
Control variables	Yes		
CEO clustering	Yes		

Panel B. Tests for number of days with repurchase transactions over the two months before the EPS announcement

	(1) Negative surprise & Low-degree CEO	(2) Positive surprise & Low-degree CEO	(3) Positive surprise & High-degree CEO
Days with repurchases before EPS announcement	0.0185	0.0144	0.0255*
	(0.671)	(0.643)	(1.892)
Observations	2,997		
Pseudo R-squared	0.1420		
Control variables	Yes		
CEO clustering	Yes		

Panel C. Tests for number of days with repurchase transactions over the three months before the EPS announcement

	(1) Negative surprise & Low-degree CEO	(2) Positive surprise & Low-degree CEO	(3) Positive surprise & High-degree CEO
Days with repurchases before EPS announcement	0.0037 (0.193)	0.0013 (0.085)	0.0106 (1.419)
Observations	2,997		
Pseudo R-squared	0.1418		
Control variables	Yes		
CEO clustering	Yes		

Table 14. CEO net insider sales and CEO network centrality

This table reports probit regressions of the likelihood of a CEO's net insider sales around the date of a repurchase transaction on the CEO's *Normalized degree*. *CEO net sales over months –1 and +1* (*CEO net sales over month +1*) is a dummy that equals one if the CEO is a net seller of her firm's shares between month –1 and month +1 around (over the month following) a repurchase date, and zero otherwise. CEO network centrality is proxied either by the continuous variable *Normalized degree* or by the dummy *High normalized degree* that is equal to one if degree centrality is higher than or equal to the sample median, and zero otherwise. All our specifications include the control variables of Table 3 except the *Number of repurchase transactions*. Detailed variable definitions can be found in the Appendix. *t-statistics* (in parentheses) are based on heteroskedasticity-robust standard errors clustered at the CEO level to account for within–CEO serial correlation. ***, **, and * denote significance at the 1, 5, and 10% level, respectively

	(1) CEO net sales over months –1 and +1	(2) CEO net sales over months –1 and +1	(3) CEO net sales over month +1	(4) CEO net sales over month +1
Normalized degree	-85.5647		-71.2398	
	(-1.152)		(-0.975)	
High normalized degree		0.5067**		0.5326***
		(2.540)		(2.617)
Observations	18,067	18,067	18,067	18,067
Pseudo R-squared	0.0761	0.0850	0.0917	0.103
Control variables	Yes	Yes	Yes	Yes
CEO clustering	Yes	Yes	Yes	Yes