

# Corporate Diversification, Information Asymmetry and Insiders'

## Trading

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### **ABSTRACT**

One mechanism through which corporate diversification could affect firm value is its possible link with the level of information asymmetry between managers and outsiders. This paper provides further evidence on this link by examining market reaction to sale and purchase of shares by corporate insiders (i.e. insiders' trading). Unlike earlier studies on the relationship between corporate diversification and information asymmetry, we distinguish between industrial diversification and geographic diversification. We find that even after controlling for other firm-specific characteristics (e.g. size and research and development expenditures) geographic diversification is negatively related to the market reaction to insiders' purchase transactions. This provides some support to the information diversification hypotheses that predicts that corporate diversification reduces the level of information asymmetry between managers and outsiders. However, it is only geographic diversification and not industrial diversification that is related to information asymmetry. This evidence provides some support for empirical work that finds positive impact of geographic diversification on firm value.

**Keywords:** *Corporate diversification, insiders' trading, information asymmetry.*

**JEL classification:** *G14, G32*

## 1 – Introduction

The finance literature explores various costs/benefits of corporate diversification (industrial and/or geographic) that may explain the existence of the so-called diversification discount/premium<sup>1</sup>. For example, it is argued that the extent of corporate diversification is related to (1) firms' debt capacity (see Lewellen, 1971; Comment and Jarrell, 1995; Low and Chen, 2004), (2) the efficiency internal capital markets (Stein, 1997; Rajan et al., 2000), (3) firms' competitive advantage (see Markides and Williamson, 1994) and (4) the level of information asymmetry between managers and outside investors (see Hadlock et al., 2001; Thomas 2002). This paper contributes to the literature by providing further empirical evidence on the relationship between corporate diversification (industrial and geographical) and the level of information asymmetry between managers and outsiders by examining whether abnormal returns on insiders' (directors') trades, which are usually attributed to insiders' 'informational advantage' over outsiders (see, e.g., Fildmuc et al., 2006), are linked to the extent of firms' industrial and geographic diversification.

Hadlock et al. (2001) and Thomas (2002) delineate and test two competing hypotheses regarding the relationship between corporate diversification and the level of information asymmetry between managers and outsiders (see also Clarke et al., 2004). According to their *transparency hypothesis*, corporate diversification is positively related to the level of information asymmetry. This hypothesis is based on two key arguments: (1) diversified firms are less transparent compared to focused firms because unlike managers, outsiders can only observe the aggregated cash flows and not the cash flows of individual segments, and (2) financial analysts who usually specialise in one or two industries may find it difficult to analyze diversified firms that operate in several different industries. In contrast, their

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<sup>1</sup> There is substantial empirical work that confirms the existence of a relationship between corporate diversification and firm value. However, there is no consensus on the direction of this relationship. See Martin and Sayrak (2003) and Villalonga (2003) for review.

*information diversification hypothesis* suggests that “assuming that the errors outsiders make in forecasting industry segment cash flows are imperfectly correlated across segments, the absolute value of the percentage error in the forecast of firm cash flows may be smaller for a diversified firm than for a focused firm” (Thomas, 2002; p. 377). Within this context, corporate diversification reduces the level of information asymmetry between managers and outsiders.

The earlier empirical evidence suggests that diversification-reducing corporate divestitures are related to the level of information asymmetry in divesting firms (see e.g. Krishnaswami and Subramaniam, 1999)<sup>2</sup>. Hadlock et al. (2001) argue that corporate diversification alleviates asymmetric information that causes negative market reaction to seasoned equity offering. Thomas (2002) finds that compared to diversified firms, focused firms have larger forecast errors and witness significantly larger three-day abnormal returns around earnings announcements (see also Clarke et al., 2004). These studies, therefore, find support for the information diversification hypothesis that predicts a negative relationship between corporate diversification and information asymmetry.

This paper provides further evidence on the link, if any, between corporate diversification and information asymmetry by examining abnormal returns around insiders' trading<sup>3</sup>. It is argued that insiders purchase (sell) shares of their firms when they possess value-relevant favourable (unfavourable) information about their firms that is not available to outsiders (see Seyhun, 1986; Jeng et al., 2003; Fidrmuc et al., 2006). Here, a large number of empirical studies document significant abnormal returns around insiders' trading of shares of their own companies. These abnormal returns are usually considered as the market's reaction to

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<sup>2</sup> See Thomas (2002) for a succinct review.

<sup>3</sup> As in previous UK studies, insiders in this paper are executive and non-executive directors.

insiders' 'informational advantage' over outsiders about the operations of their firms. Alternatively, these abnormal returns are considered as gains that insiders make due to their superior information about their firms. Within this context, abnormal returns around insiders' trades are considered as a measure of the level of information asymmetry between insiders and outsiders (see Frankel and Li, 2004).

More recent studies on insiders' trading focus on firm-specific characteristics that may determine the level of information asymmetry between corporate insiders and outsiders, and, in turn, affect abnormal returns around insiders' trades (see Aboody and Lev, 2001; Jeng et al., 2003; Huddart and Ke, 2007). An important finding of these studies is that firm size is negatively related to abnormal returns on insiders' trades because smaller firms receive less attention from financial analysts and because for smaller firms managers are more likely to possess 'significant portion of relevant information' (Jeng et al., 2001; p. 464). Therefore, it is argued, firm size is negatively related to insiders' informational advantage (i.e. smaller firms have greater information asymmetry between insiders and outsiders). In this study, we submit that it is not only that the size of a firm's assets but also the scope of firm's operations that determines the level of information asymmetry between insiders and outsiders, and, therefore, determines the abnormal returns on insiders' trades. If corporate diversification increases information asymmetry (i.e. the transparency hypothesis), then it could augment insiders' informational advantage, which, in turn, increases market reaction to insiders' trades and enhance insiders' ability to gain from their transactions. In contrast, if corporate diversification lowers information asymmetry (i.e. the information diversification hypothesis), then it could diminish insiders' informational advantage, which, in turn, decreases market reaction to insiders' trades and reduce their ability to gain from their transactions. Here, it should be noted that the existence of different managerial layers in diversified firms may

enable segment managers to distort private information for their rent-seeking purposes as in Wulf (2000) and Scharfstein and Stein (2000). Therefore, insiders' information in diversified firms may be less precise than in focused firms, which, put into the context of Huddart and Ke (2007)'s model of informed trading, predicts that insiders in diversified firms may gain less from their trading. We call this *information diminishing hypothesis*. Note that both information diminishing hypothesis and information diversification hypothesis predict a negative relationship between the extent of corporate diversification and abnormal returns associated with insiders' trading.

Our paper makes four important contributions to the existing literature. First, our empirical analysis based on insiders' trading complements existing studies on the link between corporate diversification and information asymmetry that are primarily based on measures of information asymmetry based on market microstructure or on abnormal returns around seasoned equity offering or earnings announcements (e.g. Thomas, 2002; Clarke et al., 2004). Indeed, it could be argued that our analysis based on abnormal returns following insiders' trades may better capture the degree of information asymmetry between insiders and outsiders (see Huddart and Ke, 2007). Second, previous studies on the link between corporate diversification and information asymmetry do not distinguish between industrial and geographic diversification. This distinction is very crucial because almost all empirical studies report that these two forms of diversification may have different impact on the firm value (see, e.g. Doukas and Pantzalis, 2003; Doukas and Lang, 2003; Barnes and Hardie-Brown, 2006). Therefore, we examine the impact of both geographical and industrial diversification on the level of information asymmetry measured by abnormal returns on insiders' trading. Third, our study contributes to the nascent literature on firm characteristics that are linked to gains on insiders' trading. Finally, our empirical analysis based on UK data complements the

two strands of literature (i.e. literature on insiders' trading and on corporate diversification) that are largely based on US data.

The rest of the paper is structured as follows. Section 2 describes our methodology and data. Section 3 presents our empirical results. Section 4 summarises and concludes.

## **2 – Methodology and Data**

We investigate the link between corporate diversification and information asymmetry by examining whether the extent of corporate diversification (industrial and/or geographical) has any effect on abnormal returns around directors' trades. These abnormal returns are considered as a measure of the level of information asymmetry between insiders and outsiders. We calculate abnormal returns around insiders' purchase/sale transactions using the standard event study methodology based on one factor market model. The estimation period for the parameters of the one-factor market model is 200 trading days ( $-221, -21$ ) relative to the directors' sale or purchase transaction date (day 0). The factor used is the value-weighted FTSE All Share Index for the London Stock Exchange. The effect of corporate diversification on this measure of information asymmetry is then measured using univariate and multivariate regression analysis.

We obtain directors' trading data from Hemmington Scott. The original file contains information on 151,071 transactions by directors and other large shareholders such as pension funds. From this original file, we only keep transactions by directors of firms listed on the London Stock Exchange. We are left with 89,787 transactions by 1,134 firms. Based on Datastream's INDM2 industry classification we then exclude transactions for banks, financial services, insurance companies and firms without any industry classification. Following earlier

studies on insiders' trading, we only keep open market sale and purchase transactions. Deleted transactions include, inter alia, exercise of options, sale of shares acquired as exercise of options, shares acquired as part of a corporate action by the company (e.g. rights issue or placing shares), bed and breakfast transactions, and transfer of shares into different holding. After applying these filters we are left with 34,485 transactions. We further delete transactions for firms for which accounting data or price data is not available from Datastream. We also delete transactions of less than 100 shares (see Lakonishok and Lee, 2001). Finally, we delete transactions for firms that have negative book value of equity. Our final sample consists of 14,489 purchase and sale transactions for 490 firms. We then determine net purchase transactions and net sale transactions for each transaction date in our sample by aggregating multiple purchases and/or sales by directors for each transaction day for a given firm. For example, if directors of company A engage into 5 purchase transactions to buy 1,000 shares and 5 sale transactions to sell 500 shares on January the 1<sup>st</sup>, then net transaction for January the 1<sup>st</sup> is one net purchase transaction of 500 shares.

We use segment level sales data obtained from Datastream to determine the extent of geographical and industrial diversification<sup>4</sup>. We use two measures of the extent of industrial/geographic diversification. First, we divide firms into single segment firms and multi-segment firms. Single segment firms are firms that report sales data for only one industrial (geographic) segment. Multi-segment firms are firms that report sales data for more than one industrial (geographic) segment. Second, we measure industrial (geographic) diversification using Herfindahl index calculated on the basis of industrial (geographic)

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<sup>4</sup> We also conducted our empirical analysis using segment level asset data and found no difference in our key findings.

segment level sales data. The Herfindahl index is calculated as follows (see Thomas 2002; p. 380):

$$Herf_{it} = \sum_{j=1}^{N_{it}} \left( \frac{TS_{jit}}{\sum_{j=1}^{N_{it}} TS_{jit}} \right)^2$$

Where  $N_{it}$  is the number of reported industrial (geographic) segments of firm  $i$  in year  $t$ .  $TS_{jit}$  is total sales for industrial (geographic) segment  $j$  of firm  $i$  in year  $t$ . The value of Herfindahl index ranges from 0 to 1, where 1 represents a focused firm (i.e. single segment firm). Smaller value of Herfindahl index means higher level of corporate diversification. For our descriptive statistics below, high (low) Herfindahl firms are firms for which the value of Herfindahl index is above (below) median Herfindahl index value for the whole sample period (i.e. July 1996-Jun 2006). Compared to low Herfindahl firms, high Herfindahl firms are considered as less diversified.

INSERT TABLE 1 ABOUT HERE
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Table 1 presents summary statistics for our net purchase and net sale transactions divided on the basis of the extent of corporate diversification. Like in previous studies based on UK data, the number of purchase transactions is higher than the number of sale transactions. Except the average size of net purchase transactions in Panel B, the average (median) size of purchase and sale transactions is much higher for single segment firms and firms with higher Herfindahl index value. That is, average (median) size of transaction is larger for less diversified firms. The table also reports value of net purchase and net sale transactions, which is equal to the total number of shares traded by directors for each transaction day for a given



firm times the share price at which the transaction is executed. Notice that although the number of net purchase transactions is much higher than the number of net sale transactions, the average (median) value of net sale transactions is larger than that of net purchase transactions.

INSERT TABLE 2 ABOUT HERE
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Table 2 presents summary statistics on various firm characteristics. On average, industrially and geographically less diversified firms (i.e. single segment firms and firms with high Herfindahl index) are smaller than more diversified firms. Furthermore, more diversified (industrially and geographically) firms have higher average (median) research and development expenditures and total debt as a percentage of total assets. However, less diversified firms have higher market to book ratio.

### **3 – Empirical Results**

Panel A and Panel B in Table 3 present cumulative average abnormal returns (CAARs) around directors' purchase and sale transactions, respectively. This table is very similar to Table 3 in Fidrmuc et al. (2006). Following Fidrmuc et al. (2006) we use three parametric tests (i.e. t-statistic, J1 and J2) to test whether CAARs around insiders' trades are significantly different from zero (see Campbell et al., 1997 for details).

INSERT TABLE 3 ABOUT HERE
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Our results are consistent with earlier studies on insiders' trading in the UK. There is a significant positive market reaction to directors' net purchase transactions, while there is a negative reaction to directors' sale transactions. Notice that the magnitude of market reaction to directors' purchase transaction is higher than the reaction to directors' sale transactions. For

example, 3-day CAARs for directors purchase transactions is 1.22%, while 3-day CAARs for directors' sales is only -0.31%.

INSERT TABLE 4 ABOUT HERE
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Table 4 compares CAARs around directors' purchase transactions for single segment and multi-segment firms and for low- and high Herfindahl firms. Our results suggest that the market reaction to directors purchase transactions is positive for both less diversified (i.e. single segment firms and high Herfindahl firms) and for more diversified firms (multi-segment firms and low Herfindahl firms). However, it is evident that the CAARs for less diversified firms are larger compared to CAARs for more diversified firms. For example, for firms with only one industrial segment, 1-day CAARs are 1.22% compared to 0.58% for firms that operate more than one industrial segment. Notice that when we use the Herfindahl index to divide firms into two groups, the difference between CAARs for industrially less diversified and more diversified firms become less pronounced. Similarly, Panel B in Table 3 shows 1-day CAARs associated with directors' purchases for geographically less diversified firms are higher than that for more diversified firms, 1.11% compared with 0.39%.

INSERT TABLE 5 ABOUT HERE
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Table 5 compares CAARs around directors' sale transactions for different groups of firms. Market reaction to directors' sales is negative for both less diversified (i.e. single segment firms and high Herfindahl firms) and for more diversified firms (multi-segment firms and low Herfindahl firms). Like directors' purchase transactions, the magnitude of CAARs for less diversified firms is larger compared to that of CAARs for more diversified firms. For example, CAARs following directors' sales transactions in high industrial (geographic)

Herfindahl firm are -0.16% (-0.15%). However, CAARs following directors' sales transactions in low industrial (geographic) Herfindahl firms are 0.03% (-0.00%).

These CAARs results around directors' trades seem to support the information diversification hypothesis or information diminishing hypothesis. That is, corporate diversification lowers the level of information asymmetry between corporate insiders and outsiders. Therefore, market reaction to insiders' trades is smaller for more diversified firms because, compared to less diversified firms, directors' trades in diversified firms reveal less new information to outsiders. Alternatively, it could be argued that directors of more diversified firms possess less informational advantage over outsiders compared to directors in less diversified firms and, therefore, have less opportunity to gain from their trades.

To control for other firm characteristics such as firm size and research and development expenditures that may also contribute to insiders' informational advantage, we perform a multiple regression analysis in Table 6 and Table 7. Our dependent variables in Table 6 are 1-day and 3-day abnormal returns following purchase transactions by directors. The explanatory variables of interest are *Industrial Herfindahl* and *Geographical Herfindahl*, the value of the Herfindahl index calculated on the basis of industrial (geographic) segment level sales data. In the context of the transparency hypothesis, we expect a negative relationship between Herfindahl indexes (industrial and/or geographic) and abnormal returns. That is, we expect less diversified firms (i.e. firms with larger Herfindahl index) to have lower level of information asymmetries (i.e. lower abnormal returns around insiders' purchases). In the context of the information diversification hypothesis or the information diminishing hypothesis, we expect a positive relationship between Herfindahl indexes (industrial and/or geographic) and abnormal returns. That is, we expect more diversified firms (i.e. firms with

lower Herfindahl index) to have lower level of information asymmetries (i.e. lower abnormal returns around insiders' purchases).

Table 6 reports the regression results for insiders' purchases. Control variables are firm characteristics identified in the insiders' trading literature (see Abody and Lev, 2001; Fidrmuc et al., 2006; Huddart and Ke, 2007). These are *RND Dummy*, which is a dummy variable that takes value 1 if the previous year's R&D expenditure is positive and 0 otherwise; *Market to Book Ratio* as measured by the ratio of the market value to the book value; and *Leverage* as measured by the ratio of debt to total assets. Industry dummy variables are also included. Consistent with the results of Abody and Lev (2001) and Huddart and Ke (2007), we find that R&D expenditures are positively related to 1-day and 3-day abnormal returns to insiders' purchases. Furthermore, consistent with earlier studies on insiders' trading, firm size is found to have a negative impact on abnormal returns around insiders' purchase transactions (e.g. Seyhun, 1986; Lakonishok and Lee, 2001; Jeng et al., 2003). Leverage does not have any significant relationship with abnormal returns around insiders' purchases.

INSERT TABLE 6 ABOUT HERE
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For the purpose of this study, the most relevant independent variables are the Herfindahl index for geographic diversification and for industrial diversification. As outlined above, a larger value of Herfindahl index signifies less corporate diversification. Results in Table 6 suggest that even after controlling for size and research and development expenditures, Geographical Herfindahl has a significant positive relationship with 1-day and 3-day abnormal returns around insiders' purchase transactions. These results provide support to the information diversification and/or information diminishing hypothesis. That is, the higher the

extent of geographic diversification, the lower the level of information asymmetry between managers and outsiders. The results seem to support our argument that it is not only that the size of a firm's assets but also the *geographic* scope of firm's operations that determines the level of information asymmetry between insiders and outsiders, and, therefore, determines the abnormal returns on insiders' trades. Table 7 documents results for multivariate regression analysis for abnormal returns following insiders' sale transactions. The results suggest that none of the firm-specific characteristics are significantly related to 1-day or 3-day abnormal returns. This is consistent with the notion that insiders' sales may be motivated by liquidity needs rather than informational advantage based on firm characteristics (see e.g. Lakonishok and Lee, 2001; Fidrmuc et al., 2006).

INSERT TABLE 7 ABOUT HERE
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#### **4 – Summary and conclusion**

This paper provides empirical evidence on the relationship between corporate diversification (industrial and geographical) and the level of information asymmetry between managers and outsiders by examining whether abnormal returns on insiders' (directors') trades are linked to the extent of firms' industrial and geographic diversification. Particularly, we distinguish between industrial and geographic diversification because these two forms of diversification may have different impact on the firm value. We document that market reaction to insiders' purchase and sale transactions is smaller for more diversified firms. After controlling for firm characteristics, we find that that the higher the extent of geographic diversification, the lower the abnormal returns on insiders' purchases. Overall the findings support our argument that firm size and the *geographic* scope of firm's operations determines the level of information asymmetry between insiders and outsiders and therefore, abnormal returns on insiders' trades.

The findings are consistent with the Hadlock et al. (2001) and Thomas (2002)'s *information diversification hypothesis*. It also supports the *information diminishing hypothesis* that insiders in diversified firms may have less precise information than insiders in focused firms and, therefore, have less opportunity to gain from their trades.

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**TABLE 1 – Summary Statistics for Directors’ Trades**

**Panel A – Industrial Diversification**

	Single Segment Firms		Multi-Segment Firms		High Herfindahl Firms		Low Herfindahl Firms	
<b>Number of Net Purchase Transactions</b>	2,322		4,605		4,313		2,614	
<b>Number of Net Sale Transactions</b>	978		1,382		1,635		725	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
<b>Size of Net Purchase Transaction</b>	250,289.34	10,000.00	53,707.92	7,119.00	15,8971.42	10,000.00	54,684.30	6,408.00
<b>Size of Net Sale Transaction</b>	348,159.02	40,000.00	266,225.87	25,000.00	249,974.23	31,175.00	413,401.12	23,000.00
<b>Value of net purchase transaction</b>	92.02	14.17	60.60	15.25	79.90	14.43	56.57	15.90
<b>Value of net sale transaction</b>	1,175.04	94.52	738.27	92.05	897.39	94.20	968.62	92.10

**Panel B – Geographical Diversification**

	Single Segment Firms		Multi-Segment Firms		High Herfindahl Firms		Low Herfindahl Firms	
<b>Number of Net Purchase Transactions</b>	1,897		5,031		3,931		2,997	
<b>Number of Net Sale Transactions</b>	721		1,639		1,585		775	

	Mean	Median	Mean	Median	Mean	Median	Mean	Median
<b>Size of Net Purchase Transaction</b>	80,823.97	9,992.00	134,252.44	8,377.00	164,091.71	10,000.00	61,295.49	6,000.00
<b>Size of Net Sale Transaction</b>	312,399.01	245,72.00	294,804.14	30,984.00	350,624.08	31,254.00	197,012.26	25,000.00
<b>Value of net purchase transaction</b>	56.53	11.75	76.65	16.49	69.77	14.33	72.94	15.77
<b>Value of net sale transaction</b>	809.03	61.40	967.77	108.68	1029.92	89.70	692.98	99.11

Panels A and B show the summary statistics for all UK directors' trades during 1996 and 2006, divided on the basis of the extent of corporate diversification. Panel A refers to industrial diversification. Panel B refers to geographical diversification. In both Panels, two measures of the extent of diversification are used: i) Single segment firms are firms that report sales data for only one industrial (geographic) segment. Multi-segment firms are firms that report sales data for more than one industrial (geographic) segments; ii) High (low) Herfindahl firms are firms for which the value of Herfindahl index (calculated as in Thomas, 2002; p. 380) is above (below) median Herfindahl index value for the whole sample period (i.e. July 1996-Jun 2006). Net purchase (sale) transactions are aggregating multiple purchases and/or sales by directors for each transaction day for a given firm. *Number of Net Purchase (Net Sale) Transactions* is the total number of net transactions during the whole sample period. *Size of Net Purchase (Net Sale) Transactions* is the total number of shares traded by directors for each transaction day for a given firm. *Value of Net Purchase (Net Sale) Transactions* is the total number of shares traded by directors for each transaction day for a given firm times the share price at which the transaction is executed.

**TABLE 2 – Descriptive Statistics for Firm Characteristics (firm-years)****Panel A - Industrial Diversification**

	Single Segment Firms		Multi-Segment Firms		High Herfindahl Firms		Low Herfindahl Firms	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
<b>Total Assets</b>	1,113.47	97.61	3,602.98	586.30	2,370.43	170.61	3,412.64	667.00
<b>Market to Book Ratio</b>	7.58	2.48	4.69	2.35	6.25	2.34	4.70	2.49
<b>Research &amp; Development</b>	18.00	0.00	39.18	0.00	28.59	0.00	37.72	1.70
<b>Total Debt % Total Assets</b>	15.29	11.09	21.62	20.61	18.00	16.98	21.91	20.89
<b>Return on Equity</b>	14.78	12.85	17.17	13.89	14.51	13.40	17.91	13.98

**Panel B – Geographical Diversification**

	Single Segment Firms		Multi-Segment Firms		High Herfindahl Firms		Low Herfindahl Firms	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
<b>Total Assets</b>	812.04	87.759	2,943.27	337.10	1,662.4	168.42	3,907.53	536.77
<b>Market to Book Ratio</b>	11.80	1.98	5.12	2.41	6.14	2.20	5.14	2.57
<b>Research &amp; Development</b>	6.74	0	34.33	0	9.20	0	55.58	3.36
<b>Total Debt % Total Assets</b>	16.68	13.04	19.76	19.19	17.34	15.40	21.70	21.66
<b>Return on Equity</b>	15.93	11.71	15.83	13.73	15.69	12.99	15.99	14.37

Panels A and B show the summary statistics for characteristics of UK firms with directors' trades during 1996 and 2006 in our sample, divided on the basis of the extent of corporate diversification. Panel A refers to industrial diversification. Panel B refers to geographical diversification. In both Panels, two measures of the extent of diversification are used: i) Single segment firms are firms that report sales data for only one industrial (geographic) segment. Multi-segment firms are firms that report sales data for more than one industrial (geographic) segments; ii) High (low) Herfindahl firms are firms for which the value of Herfindahl index (calculated as in Thomas, 2002; p. 380) is above (below) median Herfindahl index value for the whole sample period (i.e. July 1996-Jun 2006). All accounting data are at the previous year of the transaction. *Total Assets* is in million pounds. *Research and Development* is the Research and Development expenditure in million pounds.

**TABLE 3 – Market Reaction to Directors' Trades**

	Panel A: Purchase Transactions				Panel B: Sale Transactions			
	<i>CAAR</i> (-5,-1)	<i>CAAR</i> (0,1)	<i>CAAR</i> (0,3)	<i>CAAR</i> (0,21)	<i>CAAR</i> (-5,-1)	<i>CAAR</i> (0,1)	<i>CAAR</i> (0,3)	<i>CAAR</i> (0,21)
<b>CAAR</b>	<b>-1.66%</b>	<b>0.79%</b>	<b>1.22%</b>	<b>2.74%</b>	<b>0.84%</b>	<b>-0.10%</b>	<b>-0.31%</b>	<b>-1.86%</b>
<b>t-stat.</b>	-7.71	6.49	8.90	11.94	6.70	-1.32	-3.01	-7.51
<b>J1</b>	-54.37	26.12	40.79	89.64	17.91	-2.11	-6.66	-39.58
<b>J2</b>	-73.51	26.59	41.81	83.54	20.91	-3.37	-9.26	-49.08

Panels A and B reports the cumulative average abnormal returns (CAARs) for directors' purchases and sales for four intervals around the announcement day of the transactions. The abnormal returns are estimated over the (-200;-21) day window, based on the one-factor market model. The factor used is the value-weighted FTSE All Share Index for the London Stock Exchange. The *t-stat*, *J1* and *J2* are the test statistics based on Campbell et al. (1997).

**TABLE 4 – Market Reaction to Directors' Purchases**

		Panel A: Industrial Diversification				Panel B: Geographic Diversification			
		<i>CAAR</i> <i>(-5,-1)</i>	<i>CAAR</i> <i>(0,1)</i>	<i>CAAR</i> <i>(0,5)</i>	<i>CAAR</i> <i>(0,21)</i>	<i>CAAR</i> <i>(-5,-1)</i>	<i>CAAR</i> <i>(0,1)</i>	<i>CAAR</i> <i>(0,5)</i>	<i>CAAR</i> <i>(0,21)</i>
Single Segment Firms	<b>CAAR</b>	<b>-1.96%</b>	<b>1.22%</b>	<b>2.28%</b>	<b>3.31%</b>	<b>-1.40%</b>	<b>1.21%</b>	<b>2.04%</b>	<b>2.89%</b>
	<b>t-stat.</b>	-7.71	7.78	11.01	9.99	-6.57	8.29	10.03	8.52
	<b>J1</b>	-29.98	20.59	38.34	55.77	-23.89	20.64	34.74	49.33
	<b>J2</b>	-44.17	23.46	42.06	53.76	-33.62	23.09	36.90	52.19
Multi-Segment Firms	<b>CAAR</b>	<b>-1.66%</b>	<b>0.58%</b>	<b>1.14%</b>	<b>2.45%</b>	<b>-1.81%</b>	<b>0.64%</b>	<b>1.32%</b>	<b>2.68%</b>
	<b>t-stat.</b>	-10.92	2.64	8.90	10.94	-3.39	3.41	3.42	3.41
	<b>J1</b>	-47.68	16.60	32.63	70.27	-85.79	30.15	62.59	126.69
	<b>J2</b>	-58.80	15.96	30.56	64.28	-65.62	17.03	35.15	65.99
High Herfindahl Firms	<b>CAAR</b>	<b>-1.64%</b>	<b>0.87%</b>	<b>1.70%</b>	<b>2.98%</b>	<b>-1.75%</b>	<b>1.11%</b>	<b>1.99%</b>	<b>3.03%</b>
	<b>t-stat.</b>	-10.83	8.78	12.40	13.18	-10.21	10.41	13.96	12.51
	<b>J1</b>	-41.07	21.67	42.48	74.49	-42.33	26.78	48.12	73.42
	<b>J2</b>	-56.54	23.85	43.99	73.49	-52.69	28.39	50.61	73.49
Low Herfindahl Firms	<b>CAAR</b>	<b>-1.80%</b>	<b>0.68%</b>	<b>1.23%</b>	<b>2.35%</b>	<b>-1.64%</b>	<b>0.39%</b>	<b>0.91%</b>	<b>2.35%</b>
	<b>t-stat.</b>	-7.94	5.16	7.43	8.38	-8.61	3.30	5.79	9.29
	<b>J1</b>	-38.34	14.42	26.10	49.93	-36.21	8.53	19.99	51.94
	<b>J2</b>	-47.05	12.66	23.70	41.59	-51.42	7.93	16.94	42.86

Panels A and B reports the cumulative average abnormal returns (CAARs) for directors' purchases for four intervals around the announcement day of the transactions, divided on the basis of the extent of corporate diversification. Panel A refers to industrial

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diversification. Panel B refers to geographical diversification. In both Panels, two measures of the extent of diversification are used: i) Single segment firms are firms that report sales data for only one industrial (geographic) segment. Multi-segment firms are firms that report sales data for more than one industrial (geographic) segments; ii) High (low) Herfindahl firms are firms for which the value of Herfindahl index (calculated as in Thomas, 2002; p. 380) is above (below) median Herfindahl index value for the whole sample period (i.e. July 1996-Jun 2006). The abnormal returns are estimated over the  $(-200,-21)$  day window, based on the one-factor market model. The factor used is the value-weighted FTSE All Share Index for the London Stock Exchange. The *t-stat*, *J1* and *J2* are the test statistics based on Campbell et al. (1997).

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**TABLE 5 – Market Reaction to Directors' Sales**

		Panel A: Industrial Diversification				Panel B: Geographic Diversification			
		<i>CAAR</i> <i>(-5,-1)</i>	<i>CAAR</i> <i>(0,1)</i>	<i>CAAR</i> <i>(0,5)</i>	<i>CAAR</i> <i>(0,21)</i>	<i>CAAR</i> <i>(-5,-1)</i>	<i>CAAR</i> <i>(0,1)</i>	<i>CAAR</i> <i>(0,5)</i>	<i>CAAR</i> <i>(0,21)</i>
<b>Single Segment Firms</b>	<b>CAAR</b>	<b>0.96%</b>	<b>-0.10%</b>	<b>-0.79%</b>	<b>-2.17%</b>	<b>0.82%</b>	<b>-0.11%</b>	<b>-0.65%</b>	<b>-1.72%</b>
	<b>t-stat.</b>	4.48	-0.79	-3.57	-4.93	4.03	-0.84	-2.55	-3.47
	<b>J1</b>	12.23	-1.27	-10.03	-27.53	10.09	-1.41	-8.06	-21.19
	<b>J2</b>	13.66	-3.35	-13.92	-33.18	12.19	-2.80	-10.98	-29.19
<b>Multi-Segment Firms</b>	<b>CAAR</b>	<b>0.75%</b>	<b>-0.10%</b>	<b>-0.57%</b>	<b>-1.64%</b>	<b>0.85%</b>	<b>-0.09%</b>	<b>-0.66%</b>	<b>-1.92%</b>
	<b>t-stat.</b>	5.00	-1.07	-3.66	-5.74	5.41	-1.02	-4.49	-6.81
	<b>J1</b>	13.08	-1.71	-9.84	-28.44	14.81	-1.61	-11.53	-33.43
	<b>J2</b>	15.82	-1.58	-11.30	-36.22	17.00	-2.18	-13.85	-39.53
<b>High Herfindahl Firms</b>	<b>CAAR</b>	<b>0.74%</b>	<b>-0.16%</b>	<b>-0.78%</b>	<b>-1.93%</b>	<b>0.84%</b>	<b>-0.15%</b>	<b>-0.76%</b>	<b>-2.12%</b>
	<b>t-stat.</b>	4.99	-1.72	-5.07	-6.32	5.94	-1.62	-4.72	-6.86
	<b>J1</b>	13.03	-2.73	-13.64	-33.93	14.86	-2.61	-13.42	-37.42
	<b>J2</b>	4.99	-1.72	-5.07	-6.32	17.89	-4.40	-17.69	-48.94
<b>Low Herfindahl Firms</b>	<b>CAAR</b>	<b>1.06%</b>	<b>0.03%</b>	<b>-0.39%</b>	<b>-1.68%</b>	<b>0.83%</b>	<b>0.00%</b>	<b>-0.45%</b>	<b>-1.31%</b>
	<b>t-stat.</b>	4.56	0.21	-1.65	-4.06	1.49	-1.17	-1.36	-1.35
	<b>J1</b>	12.87	0.35	-4.75	-20.40	7.01	0.00	-3.79	-11.04
	<b>J2</b>	15.34	0.28	-4.85	-25.19	10.87	0.42	-5.40	-15.57

Panels A and B reports the cumulative average abnormal returns (CAARs) for directors' sales for four intervals around the announcement day of the transactions, divided on the basis of the extent of corporate diversification. Panel A refers to industrial



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diversification. Panel B refers to geographical diversification. In both Panels, two measures of the extent of diversification are used: i) Single segment firms are firms that report sales data for only one industrial (geographic) segment. Multi-segment firms are firms that report sales data for more than one industrial (geographic) segments; ii) High (low) Herfindahl firms are firms for which the value of Herfindahl index (calculated as in Thomas, 2002; p. 380) is above (below) median Herfindahl index value for the whole sample period (i.e. July 1996-Jun 2006). The abnormal returns are estimated over the (-200;-21) day window, based on the one-factor market model. The factor used is the value-weighted FTSE All Share Index for the London Stock Exchange. The *t-stat*, *J1* and *J2* are the test statistics based on Campbell et al. (1997).

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Figure 1 – CAR for Purchase Transactions and Industrial Diversification

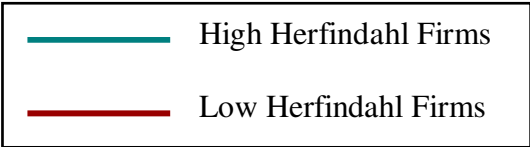
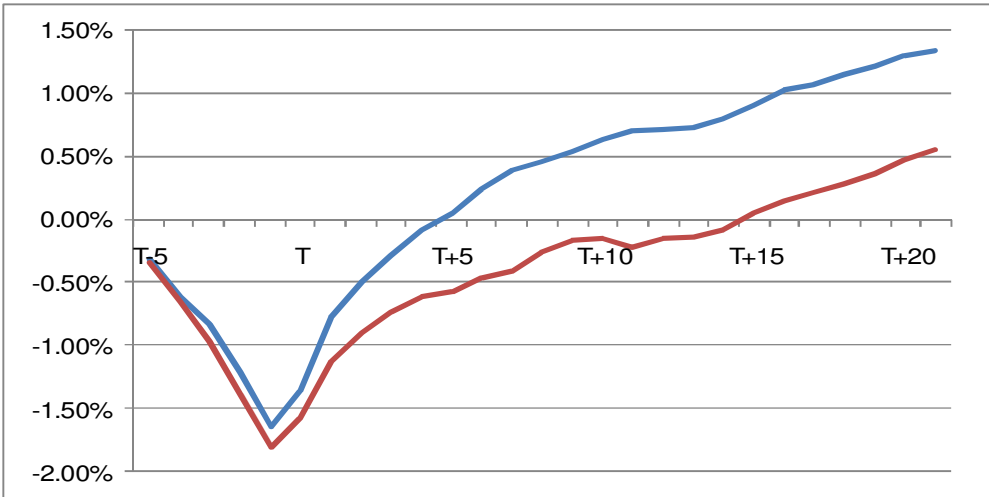
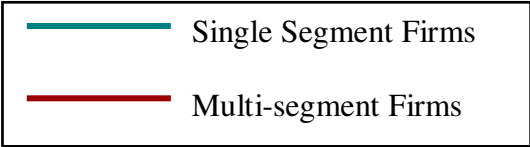
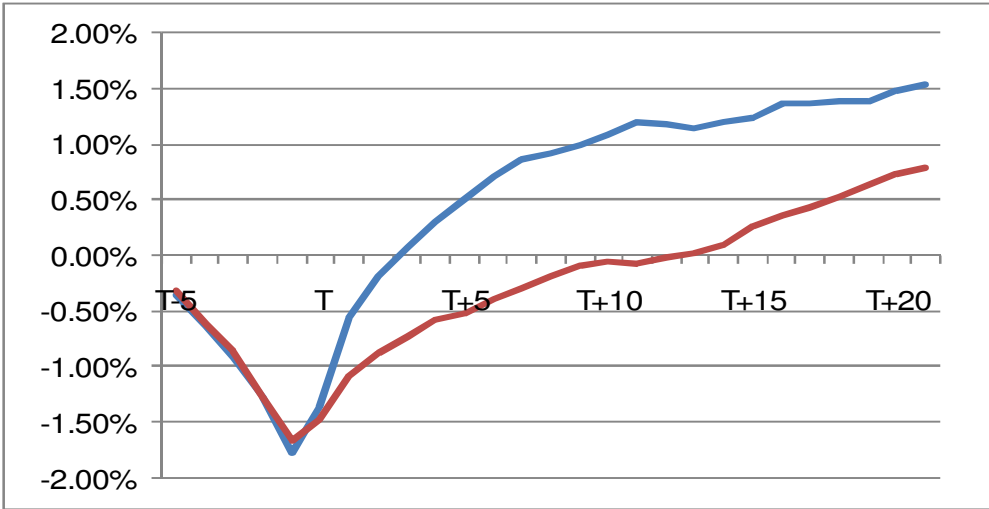


Figure 2 – CAR for Purchase Transactions and Geographic Diversification

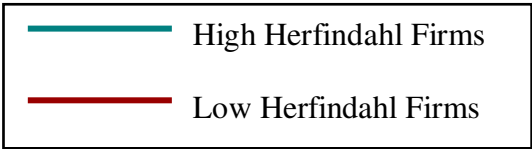
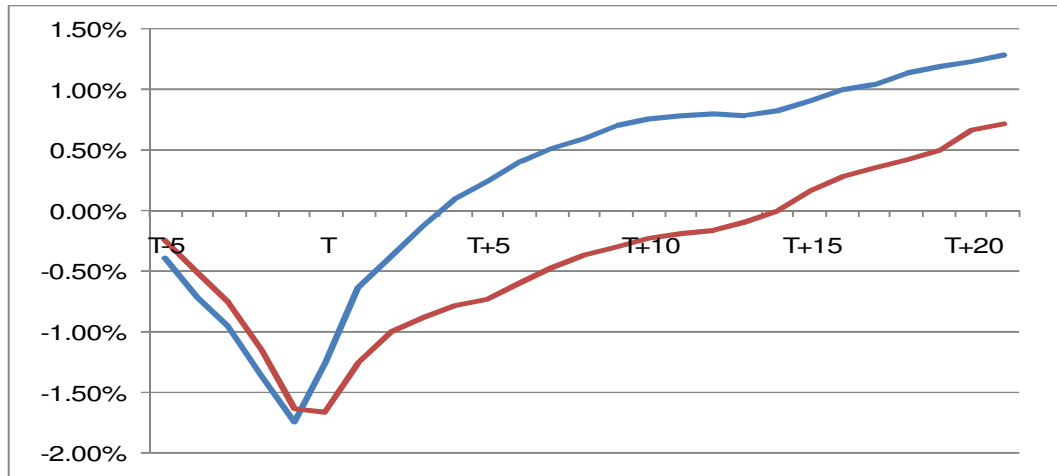
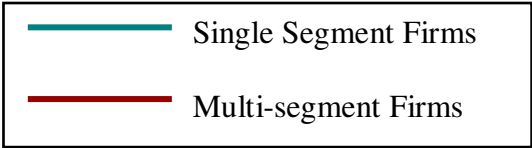
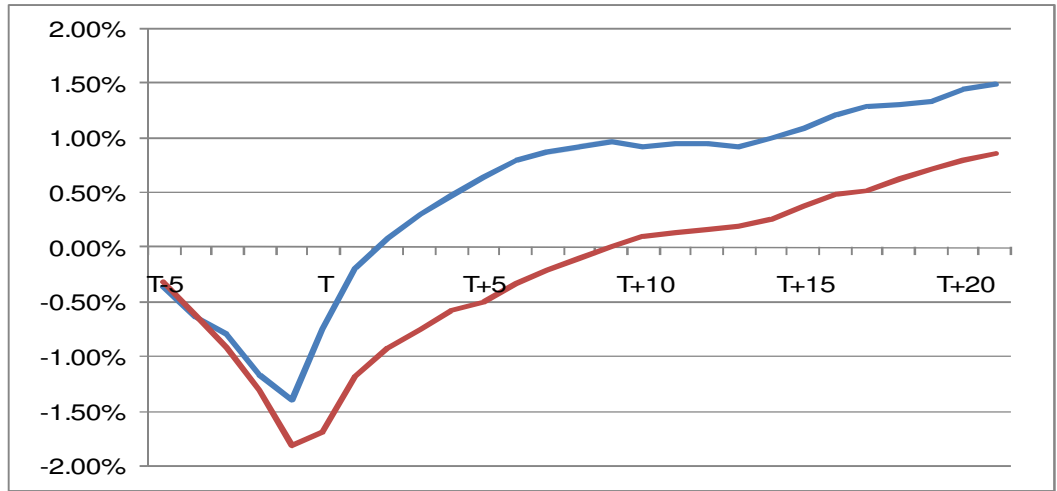


Figure 3 – CAR for Sale Transactions and Industrial Diversification

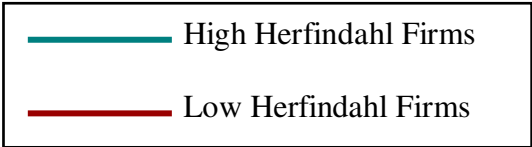
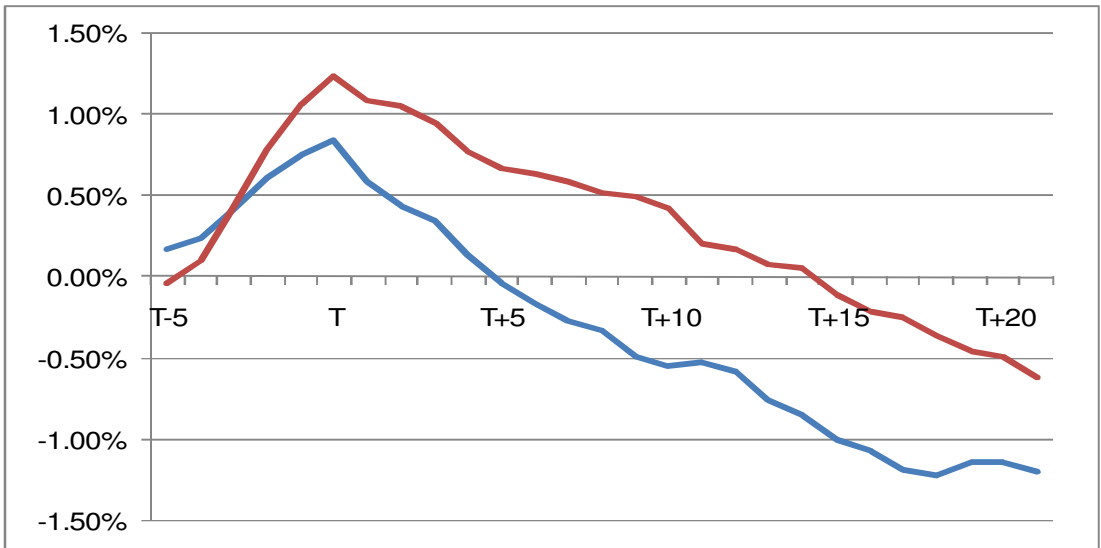
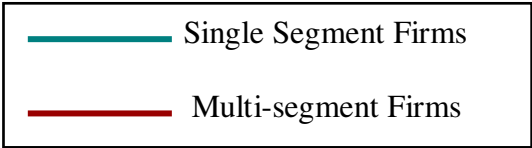
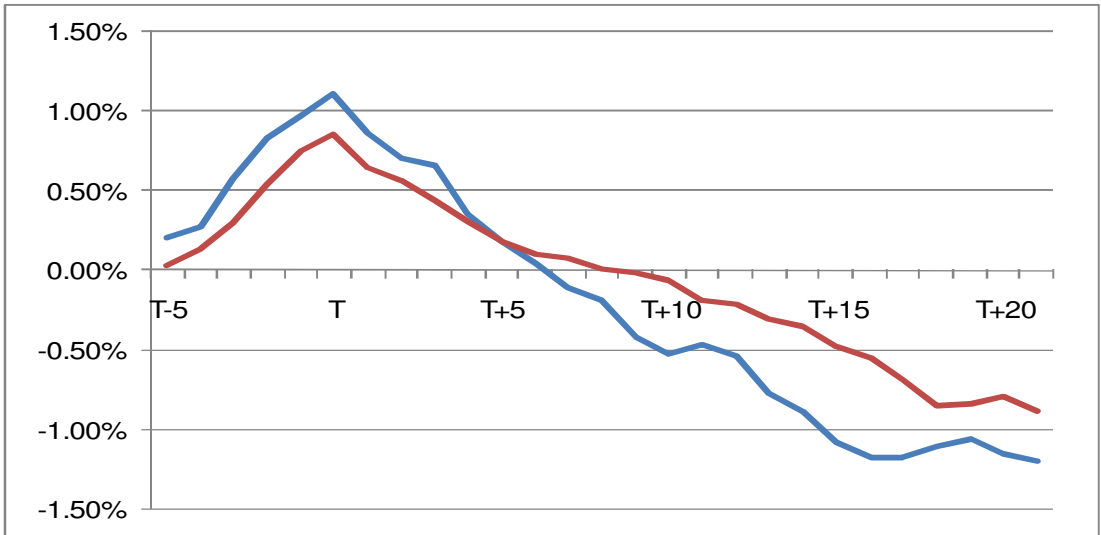
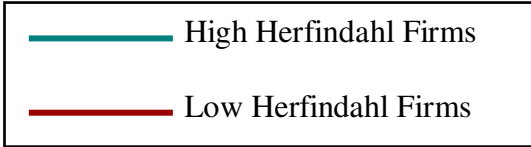
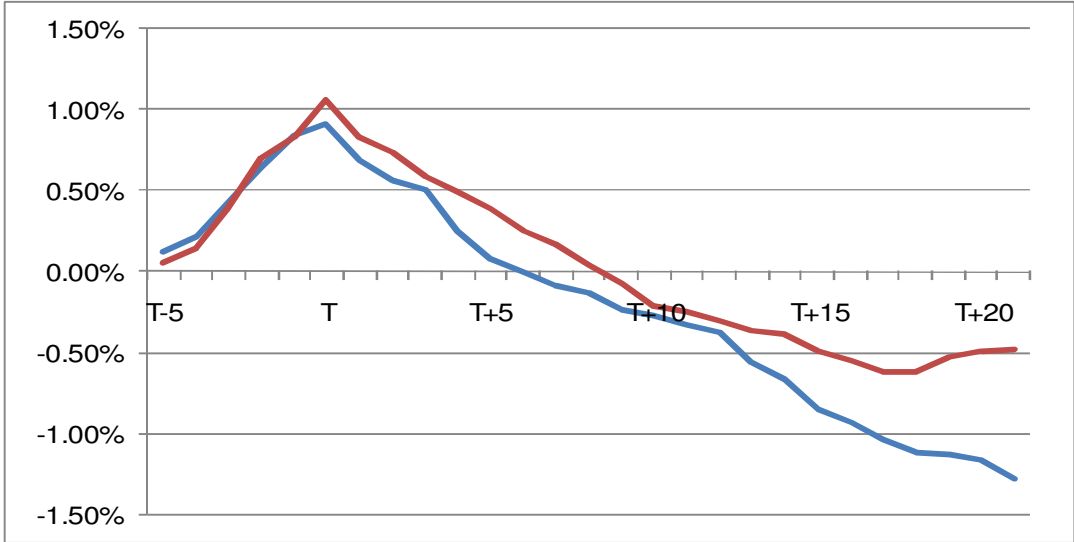
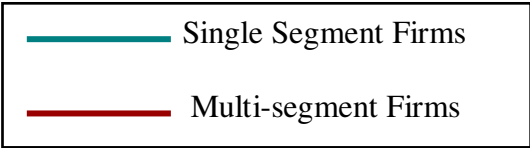
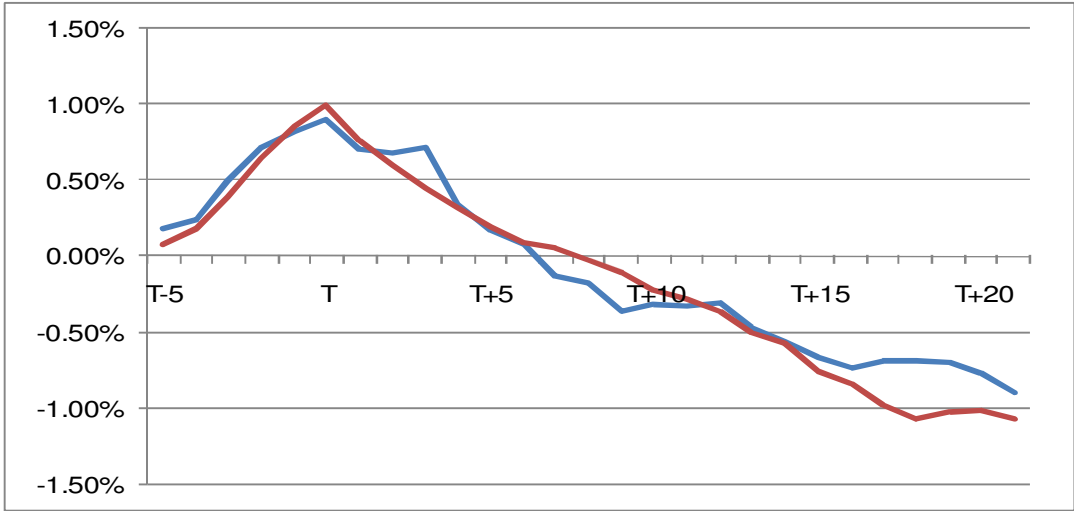


Figure 4 – CAR for Sale Transactions and Geographic Diversification



**TABLE 6 – OLS Regressions for Purchase Transactions**

	Panel A – Dependent Variable CAR (0,1)			Panel – Dependent Variable CAR (0,3)		
	<i>Coefficients</i> ( <i>t-statistics</i> )	<i>Coefficients</i> ( <i>t-statistics</i> )	<i>Coefficients</i> ( <i>t-statistics</i> )	<i>Coefficients</i> ( <i>t-statistics</i> )	<i>Coefficients</i> ( <i>t-statistics</i> )	<i>Coefficients</i> ( <i>t-statistics</i> )
<b>Constant</b>	-0.002 (-0.825)	0.020 (4.356) <sup>***</sup>	0.013 (1.817) <sup>*</sup>	-0.001 (-0.498)	0.032 (5.806) <sup>***</sup>	0.029 (3.448) <sup>***</sup>
<b>Industrial Herfindahl</b>	0.005 (1.578)	0.000 (-0.049)	0.000 (-0.072)	0.009 (2.613) <sup>***</sup>	0.002 (0.573)	0.000 (0.060)
<b>Geographic Herfindahl</b>	0.011 (3.843) <sup>***</sup>	0.007 (2.186) <sup>***</sup>	0.008 (2.388) <sup>***</sup>	0.012 (3.638) <sup>***</sup>	0.006 (1.672) <sup>*</sup>	0.007 (1.753) <sup>*</sup>
<b>RND Dummy</b>		0.005 (2.451) <sup>***</sup>	0.004 (2.180) <sup>***</sup>		0.007 (2.992) <sup>***</sup>	0.006 (2.380) <sup>***</sup>
<b>Market to Book Ratio</b>		0.000 (1.370)	0.000 (1.002)		0.000 (0.833)	0.000 (0.487)
<b>Ln(Market Value)</b>		-0.003 (-7.253) <sup>***</sup>	-0.003 (-5.185) <sup>***</sup>		-0.005 (-9.129) <sup>***</sup>	-0.004 (-7.353) <sup>***</sup>
<b>Leverage</b>		-0.004 (-0.678)	-0.002 (-0.387)		-0.005 (-0.832)	-0.001 (-0.185)
<b>Industry Dummies</b>			Yes			Yes
<b>Adjusted R<sup>2</sup></b>	0.003	0.012	0.015	0.004	0.018	0.022
<b>F</b>	10.22 <sup>**</sup>	13.6 <sup>**</sup>	5.341 <sup>**</sup>	13.160 <sup>**</sup>	20.64 <sup>**</sup>	7.782 <sup>**</sup>

This table reports the regression results with CAR(0,1) and CAR(0,3) of directors' purchase transactions as the dependent variables. The abnormal returns are estimated over the (-200;-21) day window, based on the one-factor market model. The factor used is the value-weighted FTSE All Share Index for the London Stock Exchange. <sup>\*\*\*</sup>, <sup>\*\*</sup>, and <sup>\*</sup> denote significance at the 1%, 5% and 10%, respectively. White heteroscedasticity-consistent t-statistics are reported. All accounting data are at the previous year of the transaction. *Industrial Herfindahl* is the value of the Herfindahl index calculated on the basis of industrial segment level sales data. *Geographic Herfindahl* is the value of the Herfindahl index calculated on the basis of geographical segment level sales data. *RND Dummy* is a dummy variable that takes value 1 if the previous year's R&D expenditure is positive and 0 otherwise. *Market to Book Ratio* is the ratio of market value to book value. *Ln(Market Value)* is the logarithm of total market value. *Leverage* is the ratio of debt over total assets.

**TABLE 7 – OLS Regression for Sales Transactions**

	Panel A – Dependent Variable CAR (0,1)			Panel B – Dependent Variable CAR (0,3)		
	<i>Coefficients (t-statistics)</i>	<i>Coefficients (t-statistics)</i>	<i>Coefficients (t-statistics)</i>	<i>Coefficients (t-statistics)</i>	<i>Coefficients (t-statistics)</i>	<i>Coefficients (t-statistics)</i>
<b>Constant</b>	0.002 (0.753)	-0.007 (-1.492)	-0.006 (-0.783)	-0.001 (-0.271)	-0.012 (-1.682)*	-0.011 (-1.077)
<b>Industrial Herfindahl</b>	-0.002 (-0.833)	0.000 (-0.130)	0.000 (-0.022)	-0.004 (-1.075)	-0.001 (-0.415)	-0.001 (-0.205)
<b>Geographic Herfindahl</b>	-0.002 (-0.639)	0.002 (0.564)	0.002 (0.593)	0.001 (0.394)	0.004 (0.997)	0.005 (1.050)
<b>RND Dummy</b>		0.003 (1.482)	0.002 (1.473)		0.001 (0.429)	0.001 (0.483)
<b>Market to Book Ratio</b>		0.000 (0.427)	0.000 (0.435)		0.000 (1.132)	0.000 (1.227)
<b>Ln(Market Value)</b>		0.000 (0.990)	0.000 (0.545)		0.001 (1.132)	0.001 (1.006)
<b>Leverage</b>		0.009 (1.712)*	0.008 (1.460)		0.014 (1.913)**	0.011 (1.320)
<b>Industry Dummies</b>			Yes			Yes
<b>Adjusted R<sup>2</sup></b>	0.003	0.004	0.006	0.004	0.003	0.005
<b>F</b>	10.22**	1.55	0.727	13.160**	1.403	0.63

This table reports the regression results with CAR(0,1) and CAR(0,3) of directors' sale transactions as the dependent variables. The abnormal returns are estimated over the (-200;-21) day window, based on the one-factor market model. The factor used is the value-weighted FTSE All Share Index for the London Stock Exchange. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10%, respectively. White heteroscedasticity-consistent t-statistics are reported. All accounting data are at the previous year of the transaction. *Industrial Herfindahl* is the value of the Herfindahl index calculated on the basis of industrial segment level sales data. *Geographic Herfindahl* is the value of the Herfindahl index calculated on the basis of geographical segment level sales data. *RND Dummy* is a dummy variable that takes value 1 if the previous year's R&D expenditure is positive and 0 otherwise. *Market to Book Ratio* is the ratio of market value to book value. *Ln(Market Value)* is the logarithm of total market value. *Leverage* is the ratio of debt over total assets.