

## THE EFFECT OF INDUSTRY HOMOGENEITY ON THE MAGNITUDE OF POST-EARNINGS ANNOUNCEMENT DRIFT: EVIDENCE FROM KOREA

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### ABSTRACT

*We examine the relationship between industry homogeneity and the magnitude of post-earnings announcement drift (hereafter, PEAD). Given that firms with more homogeneous operating cost structure are conducive to spillover of knowledge among investors, we expect that firms in highly homogenous industries have relatively low magnitude of PEAD. Using firms listed on the Korean Stock Exchange, we find that the magnitude of PEAD is negatively related to industry homogeneity, indicating that investors are more efficient for firms in a highly homogenous industry in which information is likely to be referred to peer firms. In addition, we find that the effect of industry homogeneity on the magnitude of PEAD is robust even after controlling to the effect of industry concentration. Our study contributes to the literature on exploring determinants of PEAD by linking information transfer effect in a homogenous industry to investors' informational efficiency in capital markets.*

**Keywords:** Industry homogeneity, knowledge spillover, information transfer, post-earnings announcement drift, information efficiency

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Publication date: 15 August 2019

To cite this article: Shin, H., Kim, S.-I., Park, S., & Shin, H. (2019). The effect of industry homogeneity on the magnitude of post-learning announcement drift: Evidence from Korea. *Asian Academy of Management Journal of Accounting and Finance*, 15(1), 107–127. <https://doi.org/10.21315/aamjaf2019.15.1.5>

To link to this article: <https://doi.org/10.21315/aamjaf2019.15.1.5>

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## **INTRODUCTION**

This study investigates the relationship between industry homogeneity and the magnitude of post-earnings announcement drift (hereafter, PEAD). PEAD is defined as the phenomenon of stock price continuing to drift in the direction of unexpected earnings after the earnings announcement date (Ball & Brown, 1968; Jones & Litzenberger, 1970). Since PEAD contradicts the efficient market hypothesis (EMH) which assumes that all available information is perfectly and promptly reflected in stock price, it is regarded as one of the accounting-based market anomalies. Why this phenomenon occurs and which factors influence the magnitude of PEAD have been critical issues in accounting research.

According to prior studies, PEAD is mostly related to investor under-reaction to earnings news that incorporates the information on a firm's future earnings (Bernard & Thomas, 1990; Ball & Bartov, 1996). Given that investor under-reaction to earnings news is mostly attributable to the lack of information on firm specific characteristics, many studies have explored determinants of PEAD by focusing on the information environment surrounding individual firms. The findings show that proxies for information environment such as firm size (Foster, Olsen, & Shevlin, 1984), analyst coverage (Zhang, 2006), accounting disclosure policy such as conference call (Kimbrough, 2005), and Big4 audit firm (Ferguson & Matolcsy, 2004) are negatively related to the extent of PEAD. This suggests that the rich environment providing more information about firm specific conditions improves investor efficiency for interpreting earnings information and consequently lowers the magnitude of PEAD.

However, considering that investors are willing to exert effort to obtain more information and learn technical skills on disentangling intrinsic value from released information on target firms, we note that PEAD is also affected by knowledge spillover among investors. The spillover effect of knowledge is mostly documented in the literature on auditor incentives to audit specialisation. Auditors try to specialise in industries conducive to knowledge transfer across clients with similar audit processes to achieve lower costs (Gramling & Stone, 2001; Reichelt & Wang, 2010). This means that audit efficiency improves in good environmental conditions in which a certain client's information such as financial structure or accounting practice is likely to have reference to other clients. Cairney and Stewart (2015) and Bills, Jeter and Stein (2015) support the argument on audit efficiency through the spillover effect by showing that auditors lower fees for clients in industries with similar operations in which industry knowledge is likely to be transferable.

In this context, we conjecture that investors, analogous to auditors, are more efficient in forecasting firm performance for industry members with high homogeneity. The accounting of a firm in a high homogeneity industry is likely to be consistent with peer firms. As such, investors benefit from information spillover among firms which are similar in performance structure, which is reflected in accounting systems in processing earnings information. Given that PEAD is the evidence of investors' under-reaction to earnings information due to the lack of resources needed for interpreting earnings news, we expect that industry homogeneity is significantly associated with PEAD. Specifically, investors would under-react less (more) to earnings information (i.e., unexpected earnings) which arrives on an earnings announcement date for firms in high (low) homogeneity industries. Thus, we predict that the magnitude of PEAD for firms in a high homogeneity industry is lower than for firms in a low homogeneity industry and hypothesise that the magnitude of PEAD is negatively related to industry homogeneity.

To test our hypothesis, we conduct a series of the regression analyses. Using a sample of 8,458 firm-years for KSE-listed firms from 2005 to 2015, we find that the extent of PEAD is lower for firms in highly homogenous industries than in less homogenous industries, supporting the information spillover effect. These results indicate that the consistent accounting practice among industry members with high homogeneity plays a role in enhancing information transfer and consequently mitigating investor under-reaction to earnings information. Additionally, we find the non-monotonic effect of industry homogeneity on PEAD from evidence that the negative relationship between industry homogeneity and PEAD is more pronounced for firms in relatively high homogeneity industries. Overall, our results suggest that market participants are more efficient in processing information for firms in industries with high homogeneity.

Our study has value for academic researchers as well as practitioners. First, this study adds to the literature on the determinants of investor informational efficiency in capital markets by linkage of industry structure (i.e., industry homogeneity) and investor under-reaction to earnings news. While previous studies documented the role of information transfer by industry structure in forecasting future earnings, little research has examined the impact of industry structure on PEAD induced by investor informational inefficiency. Second, by connecting homogeneity in cost structure within the same industry to an accounting-based market anomaly (i.e., PEAD), our study sheds light on the spill-over effect on the market's informational efficiency and usefulness of accounting consistency in processing information. As such, our paper provides an

opportunity to overhaul the accounting practice and regulation for each industry and to enhance investor informational efficiency.

## **RESEARCH BACKGROUND AND HYPOTHESIS DEVELOPMENT**

### **Post Earnings Announcement Drift and Intra-industry Informational Environment**

Post-earnings announcement drift is defined as the phenomenon in which stock returns drift continuously for several periods in the direction of unexpected earnings following the earnings announcement date (Ball & Brown, 1968; Jones & Litzenberger, 1970; Freeman & Tse, 1989). Since this contradicts the efficient market hypothesis which suggests that stock price fully and immediately reflects public information for future earnings during the earnings announcement period, PEAD is generally understood as an accounting-based market anomaly. While many studies have explained the causes of this phenomenon from perspectives of transaction cost, risk, and methodological problems (Foster et al., 1984; Bhushan, 1994; Mendenhall, 2004), the most common explanation is investor's under-reaction to the underlying information in unexpected earnings (Bernard & Thomas, 1990; Ball & Bartov, 1996; Bartov, Radhakrishnan, & Krinsky, 2000).

The factors determining the magnitude of PEAD discussed in related literature are summarised primarily in two ways. The first is earnings quality. To the extent that PEAD is attributable to investor ignorance of the property of earnings, investor under-reaction to more persistent (volatile) earnings results in higher (lower) of PEAD magnitude (Narayanamoorthy, 2006; Cao & Narayanamoorthy, 2012). This argument is associated with investor conservatism in which investors tend to react more efficiently to bad news. Louis and Sun (2011) reported that PEAD is pronounced for firms with upward earnings management or high discretionary accruals. In addition, to the extent that earnings quality is driven by audit quality, Ferguson and Matolcsy (2004) showed the negative relationship between PEAD and audit quality measured by audit firm size. Recently, Chen, Lobo and Zhang (2017) found that an accounting-associated component of liquidity risk is positively associated with PEAD returns. They documented a liquidity risk-based role of accounting quality in explaining PEAD.

The second is information environment. A large number of studies report that proxies for information environment such as firm size, analyst coverage, institutional holdings, and accounting disclosure policy are negatively related to the extent of PEAD (Bartov et al., 2000; Bernard & Thomas, 1990; Foster et al., 1984; Kimbrough, 2005). Larger firms have a richer information environment

compared to smaller firms by providing quantitatively and qualitatively more information for investors. Moreover, they are followed by a number of analysts, who release earnings forecasts, so that investors benefit from more intermediaries in prediction of firm future earnings (Mikhail, Walther, & Willis, 2003). Bartov et al. (2000) argued that firms with high institutional holdings proxy for sophisticated investors who are superior to processing earnings information show lower PEAD magnitude. Brown and Han (2000) provided evidence that drift is smaller for large firms than for small firms which have a poorer information environment by showing the negative relations between PEAD and firm size, institutional holdings, and analyst followings. Kimbrough (2005) provided evidence of the relationship between firm disclosure policy and PEAD by showing that the magnitude of PEAD is smaller for firms that use conference calls.

### **Industry Homogeneity and Hypothesis Development**

The stream of research on industry homogeneity has reported mostly on the role of homogeneity in operating structure within an industry in information transfer through knowledge spillover which means that the information of firms within the same industry is likely to be referred to peer firms. Cairney and Young (2006) proposed the homogeneity measure in operation as the average correlation in changes in operating expenses of each firm in the same industry and reported that industry homogeneity is associated with audit specialisation. By extending Cairney and Young (2006), several papers examined the reason for the relationship and found that auditors are likely to be specialised in greater homogeneous industries because cost competition exists due to knowledge spillover effects when auditing similar clients in financial structure or accounting policy (Cairney & Stewart, 2015; Bills et al., 2015). These results indicate that the information environment with greater industry homogeneity improves audit efficiency.

Moreover, Peterson, Schmardebeck and Wilks (2015) documented the role of similarity in accounting methods across firms in investor information process by showing that accounting consistency over firms within an industry is positively related to information asymmetry, as proxied by bid-ask spread and illiquidity. Further, accounting consistency across firms is also positively related to the number of analysts following, analyst forecasting accuracy, and stock return synchronicity. This indicates that the information of firms in homogenous industries in terms of accounting practice is likely to be transferred to other peer firms and is relevant to estimate those firms' values. In this context, we posit that high homogeneity with respect to operating expenses in industry represents a better condition for sharing information with peer firms. Thus, we conjecture that homogeneity in cost structure among peer firms lessens information asymmetry

in the market and enhances investors' ability to understand firms' future performance.

Given the evidence that investor informational efficiency on earnings news is determined by the information environment which provides more rich sources in predicting future earnings, we propose that PEAD is related to the extent of homogeneity in production activity among peer firms within the same industry. For firms in industries with a good information environment which provides more information referable to other peer firms, investors are more efficient in forecasting firms' future performance. Specifically, investors would under-react less to earnings information (i.e., unexpected earnings) which arrives on earnings announcement date for firms with greater homogeneity within the industry, resulting in lower stock price drift (i.e., PEAD). Thus, we expect higher homogeneity in industry to incrementally mitigate the magnitude of PEAD. On the contrary, investors would be more likely to have difficulty interpreting earnings news of firms with less homogeneity in industry. As a result, they are likely slow to respond to the information implied in earnings news; consequently, the stock price drifts in the same direction of unexpected earnings over several periods after the earnings announcement. That is, the magnitude of PEAD for firms in an industry with higher homogeneity is lower than for firms in an industry with low homogeneity. We thus propose the following hypothesis:

H: The magnitude of PEAD is negatively related to industry homogeneity.

## METHODOLOGY

### Industry Homogeneity

Industry homogeneity refers to a similarity of the cost structure of firms within the same industry (Cairney & Young, 2006). Several studies viewed the extent to which changes in firm operating expenses are more correlated with other firms based on homogeneity. Accordingly, we measure the proxy of industry homogeneity as an average correlation of all firms within an industry for changes in operating expenses. To be specific, we calculate the correlation coefficient of the changes in operating expenses of each firm with the other firms in the same industry for five rolling periods and then calculate the average of those coefficients by industry. Equation (1) represents the measure of industry homogeneity (HOGN):

$$HOGN_t = \left[ \sum_{k=1}^n Corr(\Delta OEX_{it}, \Delta OEX_{jt})_k \right] \times \frac{1}{n} \quad (1)$$

where  $\Delta OEX_t$  denotes the percentage change in operating expenses for year  $t$ , and operating expenses (OEX) are calculated as the sum of sales-operating income and depreciation.

### Post Earnings Announcement Drift

To test stock price drift following earnings announcement, we need to measure unexpected earnings at the earnings announcement date (UE) and the cumulative abnormal returns (CAR) following the earnings announcement date.

We measure standardised unexpected earnings based on the time-series model in which unexpected earnings is the difference between current earnings and four lagged earnings for quarter, scaled by the standard deviation of seven consecutive unexpected earnings for quarter.

$$SUE_{i,q} = \frac{EPS_{i,q} - EPS_{i,q-4}}{\sigma_{i,q}},$$

where  $EPS_{i,q}$  = quarterly earnings per share;  $EPS_{i,q-4}$  = earnings per share in the same quarter in the previous year; and  $\sigma_{i,q}$  = standard deviation of unexpected earnings ( $EPS_{i,q} - EPS_{i,q-4}$ ) over the prior eight quarters.

Next, CAR is size-adjusted cumulative abnormal returns over the 45 (or 60) trading days starting from the day after the earnings announcement (day 0) for quarter  $t$ . To calculate the average returns based on firm size, we form 25 portfolios by sorting on market value at the beginning of the year and then calculate abnormal returns by subtracting portfolio average returns from firm-specific returns.

### Model Specification

To test our hypothesis, we run the regression equation with firm-quarter-based variables as follows.

$$CAR = \beta_0 + \beta_1 DSUE + \beta_2 HOGN + \beta_3 DSUE \times HOGN + \beta_4 \ln(MV) + \beta_5 BETA + \beta_6 MTB + \beta_7 MM + \beta_8 \sigma(RET) + Fixed\ Effect + \varepsilon \quad (2)$$

- SUE : Standardised unexpected earnings estimated from the time-series model  
HOGN : Industry homogeneity  
ln(MV) : Firm size, measured as the logarithm of market value  
BETA : Firm risk, measured as the firm return sensitivity to market returns  
MTB : Market to book value ratio, measured as market value divided by total equity



MM	: Momentum returns for the previous 12 months
s(RET)	: Volatility, measured as the standard deviation of daily returns during the prior year
CAR	: Cumulative (size-adjusted) abnormal returns for 30 (45 or 60)-trading days following the earnings announcement date

Our main variable is the interaction term,  $DSUE \times HOGN$ . If high homogeneity with respect to operating expenses in an industry indicates a better condition for sharing information with peer firms from the information transfer perspective, higher homogeneity in an industry incrementally mitigates PEAD magnitude. Thus,  $\beta_3$  is expected to be significantly negative. To control for firm systematic risk partially explaining abnormal returns (CAR), we include firm size ( $\ln(MV)$ ), market-to-book ratio (MTB), beta (BETA), momentum returns (MM) as suggested by Fama and French (1993) and Carhart (1997), and stock volatility ( $\sigma(\text{Ret})$ ) in the regression model. Additionally, we control for year fixed effects by including year dummy variables. Panel data has a potential problem of estimation bias due to cross-sectional correlation and time serial autocorrelation. To address this concern, we test the statistical significance of the coefficient using firm-cluster robust-standard error (Petersen, 2009).

## Sample

Of firms listed on the Korean Stock Exchange (KSE) between 2005 and 2015, we impose the following restrictions. First, we delete firms with a fiscal year-end in non-December and firms belonging to the financial and insurance industries. To avoid estimation bias due to sampling financially distressed firms, we also delete firms with impairment of capital. Lastly, we exclude observations with missing stock returns, announcement dates, or other financial variables. Following this procedure, the final sample contains 8,458 firm-quarter observations. We retrieve quarterly earnings data, daily stock prices, and other financial variables from the Kisvalue database of NICE Investors Service Co. Ltd. (<http://www.kisvalue.com>) and obtain the earnings announcement dates from the Korean Exchange (<http://kind.krx.co.kr>).

## EMPIRICAL ANALYSIS RESULTS

### Descriptive Statistics

Table 1 reports the descriptive statistics for the test variables. Industry homogeneity (HOGN) as a main variable in our study shows the mean (median) value of 0.123 (0.087) and ranges between -0.380 and 0.983. Higher homogeneity in an



industry denotes higher correlation of the operating cost structure among peer firms. Thus, a higher (lower) value of HOGN indicates high (low) similarity in operating activity among peer firms, representing accounting consistency within the same industry. We winsorise at 1% of both the top and bottom of all variable distributions to alleviate the effect of outliers on estimation results.

Table 1  
*Descriptive statistics (N = 8,458)*

Variables	1%	25%	Mean	50%	75%	99%	Std.
SUE	-3.677	-0.606	0.059	0.034	0.688	4.171	1.358
HOGN	-0.086	0.042	0.123	0.087	0.161	0.679	0.137
ln(MV)	24.210	26.030	27.145	26.811	28.279	30.738	1.557
BETA	0.037	0.494	0.795	0.758	1.073	1.748	0.400
MTB	0.193	0.613	1.438	0.959	1.622	8.089	1.462
MM	-0.570	-0.165	0.167	0.041	0.357	2.275	0.526
$\sigma$ (Ret)	0.012	0.020	0.027	0.025	0.032	0.057	0.009
CAR45	-0.379	-0.091	0.006	0.002	0.096	0.404	0.155
CAR60	-0.420	-0.101	0.010	0.003	0.113	0.511	0.176

*Note:* SUE = standardised unexpected (quarterly) earnings, estimated by time-series model; HOGN = industry homogeneity, measured as the correlation coefficient of change in operating cost among firms within same industry; ln(MV) = firm size, measured as the logarithm of market value; BETA = firm risk, measured as the firm return's sensitivity to market returns; MTB = market to book value ratio, measured as market value divided by total equity; MM = momentum returns for previous 12 months;  $\sigma$  (Ret) = volatility, measured as the standard deviation of daily returns during prior year; CAR = cumulative (size-adjusted) abnormal returns by 45 and 60-trading days following earnings announcement

## Correlation Analysis Results

Table 2 presents the correlation analysis results of test variables, showing the Pearson (Spearman) correlation coefficient on the left (right) of the empty diagonal. For those two, the correlation coefficients of unexpected earnings (SUE) and cumulative abnormal returns (CAR) are positive and significant at the 1% level. These results indicate that stock returns drift in the direction of SUE. Our interest variable, industry homogeneity (HOGN), is shown to be significantly correlated with cumulative abnormal returns only for 60 trading days following the earnings announcement from the results of Spearman analysis. This implies that the effect of HOGN on drift in stock returns is unclear. In the next section, we further examine the relationship between PEAD magnitude and industry homogeneity (HOGN) using the regression model with several control variables known to explain abnormal returns.

Table 2  
Correlation matrix ( $N = 8,458$ )

	SUE	HOGN	ln(MV)	BETA	MTB	MM	s (Ret)	CAR45	CAR60
SUE		-0.028 (0.011)	0.035 (0.001)	-0.023 (0.031)	0.075 (<.001)	0.051 (<.001)	-0.023 (0.035)	0.071 (<.001)	0.081 (<.001)
HOGN	-0.031 (0.004)		0.074 (<.001)	-0.002 (0.843)	-0.077 (<.001)	-0.021 (0.048)	-0.115 (<.001)	-0.010 (0.362)	-0.020 (0.069)
ln(MV)	0.028 (0.010)	0.053 (<.001)		0.300 (<.001)	0.316 (<.001)	0.074 (<.001)	-0.159 (<.001)	0.038 (0.001)	0.044 (<.001)
BETA	-0.023 (0.031)	0.016 (0.144)	0.275 (<.001)		0.041 0.000	-0.116 (<.001)	0.453 (<.001)	0.005 (0.646)	0.009 (0.409)
MTB	0.081 (<.001)	-0.079 (<.001)	0.375 (<.001)	0.085 (<.001)		0.432 (<.001)	0.213 (<.001)	0.050 (<.001)	0.065 (<.001)
MM	0.071 (<.001)	0.014 (0.211)	0.077 (<.001)	-0.165 (<.001)	0.379 (<.001)		0.182 (<.001)	0.030 (0.007)	0.029 (0.007)
s (Ret)	-0.018 (0.095)	-0.094 (<.001)	-0.134 (<.001)	0.478 (<.001)	0.249 (<.001)	0.093 (<.001)		0.018 (0.091)	0.028 (0.010)
CAR45	0.079 (<.001)	0.000 (0.993)	0.046 (<.001)	0.003 (0.803)	0.061 (<.001)	0.032 (0.003)	0.009 (0.395)		0.850 (<.001)
CAR60	0.093 (<.001)	-0.011 (0.321)	0.050 (<.001)	0.004 (0.682)	0.072 (<.001)	0.037 (0.001)	0.016 (0.146)	0.847 (<.001)	

Note: The Pearson correlation coefficients are indicated on the left of the empty diagonal and Spearman on the right. The figures in parentheses are  $p$ -values. The definitions of variables are in Table 1.

### Regression Results

To test our hypothesis, we implement the regression model with the cumulative abnormal returns as the dependent variable and the interaction term of DSUE and HOGN ( $DSUE \times HOGN$ ) as the key independent variable. If the results support the information transfer hypothesis, the coefficient of  $DSUE \times HOGN$  is significantly negative, indicating that higher industry homogeneity is related to lower PEAD magnitude.

Table 3 shows that the coefficient of  $DSUE \times HOGN$  is significantly negative for the cumulative abnormal returns for both 45-trading days (CAR45) and 60-trading days (CAR60) following earnings announcement. Specifically,  $DSUE \times HOGN$  has a negative coefficient of -0.0154 ( $t$ -statistic = -2.35) on 45-trading days returns and -0.0174 ( $t$ -statistic = -2.26) on 60-trading days returns. These results are economically significant. As for cumulative abnormal returns for 45 (or 60) -trading days following earnings announcement, a one-standard-

deviation change in our homogeneity measure is associated with a decrease in stock price drift of about 1.72% (1.29%).<sup>1</sup>

These results are also robust to variables that affect cumulative abnormal returns, as presented in the results of Model (3). Consistent with the results of correlation analysis, the coefficient of unexpected earnings (DSUE) is significantly positive, meaning that PEAD exists in our sample. Thus, the negative coefficient of  $DSUE \times HOGN$  means that greater homogeneity in industry incrementally lowers PEAD magnitude, consistent with our hypothesis. For the other independent variable, the coefficients of firm size ( $\ln(MV)$ ) and market-to book ratio (MTB) are statistically significant, but firm beta (BETA), momentum returns (MM), and return volatility ( $\sigma(Ret)$ ) are not.

Table 3  
The effect of industry homogeneity on the magnitude of PEAD ( $N = 8,458$ )

	CAR45			CAR60		
	(1)	(2)	(3)	(1)	(2)	(3)
Const.	0.0178 (3.37)***	-0.0794 (-2.31)**	-0.0795 (-2.30)**	0.0162 (2.64)***	-0.1234 (-3.27)***	-0.1245 (-3.28)***
<b>DSUE</b>	<b>0.0999</b> <b>(6.44)***</b>	<b>0.0771</b> <b>(6.05)***</b>	<b>0.0943</b> <b>(5.95)***</b>	<b>0.1263</b> <b>(6.93)***</b>	<b>0.1005</b> <b>(6.80)***</b>	<b>0.1188</b> <b>(6.30)***</b>
HOGN	-0.0094 (-0.84)	–	-0.0073 (-0.66)	-0.0222 (-1.59)	–	-0.0172 (-1.27)
<b>DSUE <math>\times</math> HOGN</b>	<b>-0.0154</b> <b>(-2.35)**</b>	–	<b>-0.0146</b> <b>(-2.20)**</b>	<b>-0.0173</b> <b>(-2.26)**</b>	–	<b>-0.0162</b> <b>(-2.07)**</b>
$\ln(MV)$	–	0.0332 (2.63)***	0.0340 (2.71)***	–	0.0446 (3.27)***	0.0467 (3.42)***
BETA	–	-0.0390 (-0.69)	-0.0392 (-0.70)	–	-0.0621 (-0.97)	-0.0619 (-0.98)
MTB	–	0.0273 (2.52)**	0.0236 (2.28)***	–	0.0503 (3.93)***	0.0441 (3.41)***
MM	–	0.0000 (1.18)	0.0000 (1.16)	–	0.0000 (0.32)	0.0000 (0.34)
$s(Ret)$	–	0.8372 (0.32)	0.7304 (0.28)	–	0.3628 (1.20)	0.3365 (1.15)
Year effect	Included	Included	Included	Included	Included	Included
Firm cluster SE	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.0093	0.0116	0.0119	0.0102	0.0141	0.0144

Note: The figures in parentheses are *t*-statistics. All regression models use *t*-statistics based on robust standard errors clustered at the firm (Peterson, 2009) and include year dummies to control year fixed effect. The notation \*\*\*, \*\*, and \* denotes significance at the 1%, 5%, and 10% levels, respectively. The definitions of variables are in Table 1.

## **Portfolio Test**

In this section, we conduct portfolio test to validate our findings consistent with information transfer hypothesis. Since the gap of cumulative abnormal returns between the highest SUE and the lowest SUE indicates the extent of PEAD (Hirshleifer, Lim, & Teoh, 2009), we verify information transfer hypothesis by comparing the gap of them by the level of industry homogeneity (i.e., High HOGN/Low HOGN). Specifically, we form quintiles based on both unexpected earnings (SUE) and industry homogeneity (HOGN) by year, and we exam the average abnormal returns of each SUE portfolio combined with HOGN portfolio. If the test results support the hypothesis, then the difference in portfolio returns between extremely high SUE (SUE5) and extremely low SUE (SUE1) is lower in the highest industry homogeneity (HOGN5) than in the lowest industry homogeneity (HOGN1).

The test results are presented in Table 4. Panel A reports the cumulative abnormal returns for 45 trading days following earnings announcement for each portfolio. The difference in abnormal returns between the highest SUE (SUE5) and the lowest SUE (SUE1) is 4.02% when conditional on the extremely low industry homogeneity (HOGN1) and 2.97% when conditional on the extremely high industry homogeneity (HOGN5). It indicates that the magnitude of PEAD (i.e., the difference in abnormal returns between SUE5 and SUE1) is lower when industry homogeneity is high. This result is similar to that for abnormal returns for 60 trading days following earnings announcement in Panel B. Taken together, our findings indicate that the magnitude of PEAD is relatively small for firms with high industry homogeneity since investors less under-react to earnings information due to better condition for sharing information with peer firms, supporting our hypothesis.

Figure 1 depicts the differential behaviour of stock returns by both unexpected earnings (SUE) and the level of industry homogeneity (HOGN). For the sake of providing clear evidence on the effect of the homogeneity on PEAD, we examine the patterns of abnormal returns of extreme SUE groups, that is, SUE1 and SUE5, representing the lowest SUE group and the highest SUE group, respectively. The figure shows that while cumulative abnormal returns move on the rise in direction of SUE, those patterns are conditional on HOGN. The abnormal returns of the SUE<sup>High</sup> (i.e., SUE5) in high homogeneity group (i.e., HOGN  $\geq$  0) is lower than that in low homogeneity group (i.e., HOGN  $<$  0). Consistently, the abnormal returns of the SUE<sup>Low</sup> (i.e., SUE1) in high homogeneity group (i.e., HOGN  $\geq$  0) is lower than that in low homogeneity group (i.e., HOGN  $<$  0). This

means investor's asymmetric response to earnings news of firms with high/low industry homogeneity.

Table 4  
Portfolio analysis results ( $N = 8,458$ )

Panel A: Cumulative abnormal returns for 45 trading days following earnings announcement				
SUE Quintiles	HOGN Quintiles			ALL
	HOGN1	HOGN 2-4	HOGN 5	
<b>SUE1</b>	<b>-1.08%</b> <b>(-1.24)</b>	<b>-0.92%</b> <b>(-1.89)</b>	<b>-1.78%</b> <b>(-2.68)</b>	<b>-1.13%</b> <b>(-3.10)</b>
SUE2	0.71% (0.82)	-0.29% (-0.62)	-0.49% (-0.68)	-0.15% (-0.41)
SUE3	0.52% (0.64)	0.94% (1.82)	-0.07% (-0.09)	0.65% (1.69)
SUE4	-0.73% (-0.92)	1.58% (3.28)	1.84% (2.40)	1.15% (3.17)
<b>SUE5</b>	<b>2.94%</b> <b>(3.38)</b>	<b>2.62%</b> <b>(4.95)</b>	<b>1.19%</b> <b>(1.45)</b>	<b>2.42%</b> <b>(6.07)</b>
<b>5-1</b>	<b>4.02%</b>	<b>3.54%</b>	<b>2.97%</b>	<b>3.55%</b>

Panel B: Cumulative abnormal returns for 60 trading days following earnings announcement				
SUE Quintiles	HOGN Quintiles			ALL
	HOGN1	HOGN 2-4	HOGN 5	
<b>SUE1</b>	<b>-0.75%</b> <b>(-0.75)</b>	<b>-1.29%</b> <b>(-2.34)</b>	<b>-1.56%</b> <b>(-1.95)</b>	<b>-1.26%</b> <b>(-3.00)</b>
SUE2	1.49% (1.39)	-0.23% (-0.43)	-0.47% (-0.58)	0.03% (-0.08)
SUE3	1.51% (1.62)	1.15% (2.01)	0.35% (0.37)	1.08% (2.48)
SUE4	-0.09% (-0.09)	2.48% (4.44)	2.28% (2.66)	1.91% (4.52)
<b>SUE5</b>	<b>4.31%</b> <b>(4.40)</b>	<b>3.40%</b> <b>(5.76)</b>	<b>1.31%</b> <b>(1.51)</b>	<b>3.21%</b> <b>(7.24)</b>
<b>5-1</b>	<b>5.06%</b>	<b>4.69%</b>	<b>2.87%</b>	<b>4.47%</b>

*Note:* This table represents the average abnormal returns on each portfolio conditioned on both SUE quintiles and the HOGN (industry homogeneity) quintiles. SUE denotes the standardised unexpected earnings calculated using a time series forecast of earnings. HOGN is measured as the correlation of operating cost along peer firms in same industry. Abnormal returns are size-adjusted (value-weighted) cumulative abnormal returns over each trading days (45 or 60) following earnings announcement date. Hedge returns for portfolio of 5-1 indicates the abnormal returns from zero-investment strategy that longs portfolio with the highest SUE (SUE5) and shorts portfolio with the lowest SUE (SUE1) when both portfolios are conditioned on each HOGN quintiles. The figures in parentheses are *t*-statistics.

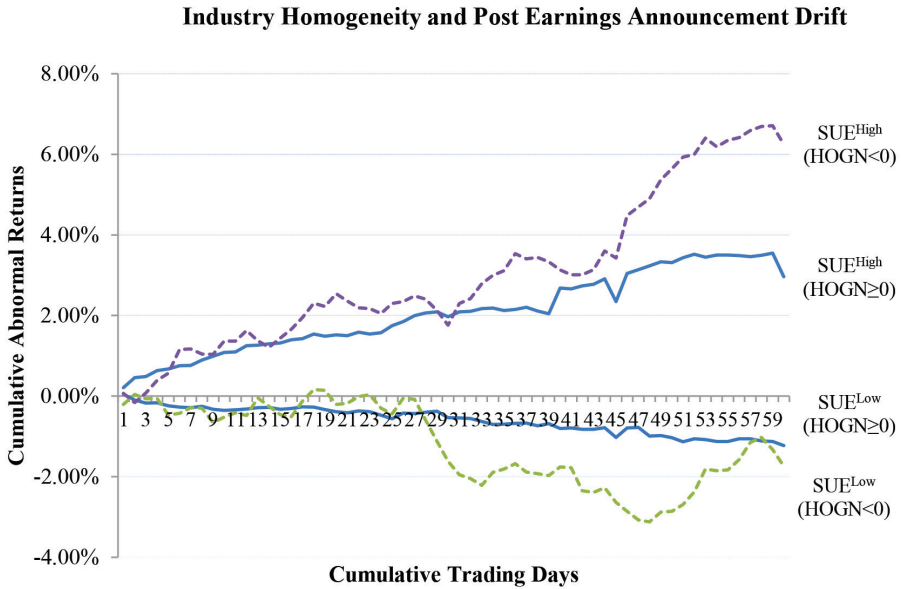


Figure 1. Industry homogeneity and post earnings announcement drift

**Additional Test**

***Non-monotonic effect of industry homogeneity on the magnitude of PEAD***

Since firm information in low homogeneity industries tends to be opaque (Peterson et al., 2015), we conjecture that the information of those firms is less conducive to transfer by information users to the market. If the effect of information transfer in investor information processing is asymmetric by industry homogeneity level, the magnitude of PEAD is also likely different by industry homogeneity level, and we expect that the incremental effect of industry homogeneity on lowering PEAD magnitude exists mainly for the firms in an industry with extremely high homogeneity. To explicitly evaluate this hypothesis, we separate industry homogeneity into high level ( $HOGN^+$ ) and low level ( $HOGN^-$ ), based on the median value of industry homogeneity distribution, and then regress cumulative abnormal returns subsequent to the earnings announcement date on these variables interacted with unexpected earnings ( $DSUE \times HOGN^+$  and  $DSUE \times HOGN^-$ ).

The results of this analysis are presented in Table 5. While the coefficient of  $DSUE \times HOGN^+$  is significantly positive, that of  $DSUE \times HOGN^-$  is negative but not statistically significant. Moreover, the coefficient of  $DSUE \times HOGN^+$  is significantly negative, but that of  $DSUE \times HOGN^-$  is not significant, for either

cumulative trading days abnormal returns. These results indicate that the negative relationship between industry homogeneity and PEAD magnitude is effective only in firms in high homogeneity industries, supporting our expectation.

Table 5  
*Non-monotonic effect of industry homogeneity on PEAD (N = 8,458)*

Variables	Dependent variable = CAR60	
	Without control variables	With control variables
	Coefficient	Coefficient
Const.	0.0180 (2.86***)	-0.1174 (-3.07***)
DSUE	0.1240 (6.53***)	0.1177 (5.99***)
HOGN <sup>+</sup>	-0.0249 (-1.73*)	-0.0187 (-1.34)
HOGN <sup>-</sup>	-0.1216 (-2.00**)	-0.0925 (-1.52)
DSUE × HOGN <sup>+</sup>	-0.0163 (-2.09**)	-0.0154 (-1.95*)
DSUE × HOGN <sup>-</sup>	-0.0055 (-0.16)	-0.0096 (-0.28)
ln (MV)		0.0044 (3.21**)
BETA		-0.0061 (-0.95)
MTB		0.0048 (3.68***)
MM		0.0015 (0.34)
s (Ret)		0.3579 (1.19)
Year effect	Included	Included
Firm cluster SE	Yes	Yes
R <sup>2</sup>	0.0106	0.0140

*Note:* The figures in parentheses are t-statistics. All regression models use t-statistics based on robust standard errors clustered at the firm (Peterson 2009) and include year dummies to control year fixed effect. The notation \*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels, respectively. The definitions of variables are in Table 1.

### ***Controlling for industry concentration effect***

Industry homogeneity is, as one proxy for industry structure, associated with industry concentration. To be specific, high homogeneous industries are likely to reveal low competition in product market, that is, to be more concentrated (Bunch & Smiley, 1992; Piotroski & Roulstone, 2004; Haw, Hu, Lee, & Wu, 2016). Bunch and Smiley (1992) document that firms in more concentrated industries are inclined to strategically interact with peer firms. This implies that industry concentration contributes to the usefulness of a firm's information to investors in estimating the value of other firms within the industry. Moreover, Piotroski and Roulstone (2004) argue that, since firm values in more concentrated industries



are more correlated with other peer firms, there is synchronicity of industry stock returns and firm specific returns. In this context, Haw et al. (2016) posit that general information transfer within an industry is stronger in concentrated industries and document the positive association between industry concentration and investor efficiency in processing accounting information.

Table 6  
*Regression results: Controlling for industry concentration effect (N = 8,433)*

Variables	Dependent variable = CAR60	
	Concentration effect	Controlling for concentration effect
	Coefficient	Coefficient
Constant	-0.1243 (-3.29***)	-0.1194 (-3.15***)
DSUE	0.1064 (6.71***)	0.1273 (6.39***)
HOGN		-0.0180 (-1.28)
DSUE × HOGN		-0.0173 (-2.22**)
HHI	-0.0630 (-2.29**)	-0.0416 (-1.82*)
DSUE × HHI	-0.1789 (-0.91)	-0.1837 (-1.22)
ln(MV)	0.0460 (3.37***)	0.0450 (3.32***)
BETA	-0.0745 (-1.17)	-0.0638 (-1.00)
MTB	0.0577 (4.27***)	0.0551 (4.08***)
MM	-0.0003 (-0.07)	0.0004 (0.09)
s (Ret)	0.3789 (1.25)	0.3440 (1.14)
Year effect	Included	Included
Firm cluster SE	Yes	Yes
R <sup>2</sup>	0.0149	0.0157
N	8,4333	8,4333

*Note:* The figures in parentheses are t-statistics. All regression models use t-statistics based on robust standard errors clustered at the firm (Petersen, 2009) and include year dummies to control year fixed effect. The notation \*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels, respectively. HHI denotes Herfindahl-Herschiman index representing the level of industry concentration, which is calculated as sum of square number of each market share for top 3 firms within industry based on the two-digit Korea Standard Industry Classification (KSIC) code. The definitions of variables are in Table 1.

Thus, to capture the effect of industry homogeneity independent of industry concentration, we control for the industry concentration effect on PEAD by including the Herfindahl-Hirschman index in the regression model. The Herfindahl-Hirschman index (HHI) represents level of industry concentration, which is calculated as the sum of square number of each market share for the top three firms within an industry based on the two-digit Korea Standard Industry

Classification (KSIC) code. Table 6 presents the analysis results, showing that even after controlling for industry concentration effect ( $DSUE \times HHI$ ) on PEAD, the coefficient of  $DSUE \times HOGN$  remains significantly negative. This result indicates that our information transfer hypothesis holds regardless of the extent of industry concentration.

***Effect of industry homogeneity on the magnitude of PEAD: Subsample analysis***

We conduct regression analysis with subsamples splitting into positive unexpected earnings (positive SUE) and negative unexpected earnings (negative SUE). Table 7 presents the test results, showing that the effect of industry homogeneity on PEAD exists for firms with negative SUE. While the coefficients of interaction term ( $DSUE \times HOGN$ ) are negative in both subsamples, the statistical significance of them appears only for subsamples of negative SUE. Specifically, the coefficients of interaction term show -0.0339 at 5% significance level for negative SUE firms but -0.0272 yet insignificant for positive SUE firms. This result indicates that the reduction in PEAD by information transfer among investors is effective just in negative SUE firms in our sample. As for cumulative abnormal returns, in terms of economic significance, a one-standard-deviation change in our homogeneity measure is associated with a decrease in stock price drift of about 2.53% ( $=-0.007/0.003$ ).

For this differential effect of industry homogeneity by the SUE sign, there may be two possible reasons. First, even though cumulative abnormal returns are systematically associated with SUE, those in positive SUE firms are relatively noisy, and statistically the response on industry homogeneity conditioned SUE level has certain random error. Second, market participants tend to respond more instantly to loss or decreased earnings, which is referred to as market's conservatism to bad news (Narayanamoorthy, 2006). Thus, they reflect earnings information to stock price more efficiently, and consequently lower PEAD is largely found in firms with loss or earnings shock (Narayanamoorthy, 2006; Nah & Shin, 2012). If information transfer among investors could intensify investor's instantaneous response to earnings news, the effect of industry homogeneity on the reduction of PEAD magnitude is pronounced for firms with negative earnings.

Table 7

The effect of industry homogeneity on the magnitude of PEAD: Subsample analysis ( $N = 8,458$ )

Variables	Dependent variable = CAR60	
	Firms with positive SUE	Firm with negative SUE
	Coefficient	Coefficient
Constant	-0.0588 (-1.03)	-0.1828 (-3.16***)
DSUE	0.1190 (3.03***)	0.1034 (2.49**)
HOGN	0.0095 (0.37)	-0.0504 (-2.14**)
DSUE × HOGN	-0.0272 (-1.51)	-0.0339 (-1.88*)
ln(MV)	0.0193 (0.92)	0.0703 (3.43***)
BETA	0.0380 (0.39)	-0.1470 (-1.79*)
MTB	0.0331 (1.66*)	0.0674 (3.07***)
MM	0.0097 (1.50)	-0.0064 (-0.95)
s (Ret)	2.2586 (0.47)	3.8109 (1.03)
Year effect	Included	Included
Firm cluster SE	Yes	Yes
R <sup>2</sup>	0.0103	0.0143

Note: The figures in parentheses are *t*-statistics. All regression models use *t*-statistics based on robust standard errors clustered at the firm (Petersen, 2009) and include year dummies to control year fixed effect. The notation \*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels, respectively. The definitions of variables are in Table 1.

## CONCLUSION

This study examines the impact of industry homogeneity on the magnitude of PEAD. Using previous evidence that firms in an industry with more homogeneous operating cost structure are conducive to knowledge spillover among investors, we conjecture that industry homogeneity makes firm information more useful to investors in interpreting accounting information of other firms within the industry. Thus, we hypothesize that industry homogeneity is negatively related to the magnitude of PEAD which occurs due to investor under-reaction to earnings news.

To test our hypothesis, we implement a series of regression analyses. Using KSE-listed firms from 2005 to 2015, our results show that the magnitude of PEAD is lower for firms in homogenous industries than in low homogeneity industries. These results indicate that homogenous industry enhances investor informational efficiency by providing a good information environment, in which

more and relevant information in predicting firm future earnings are likely to be transferable due to accounting consistency among peer firms. Additionally, we show the non-monotonic effect of industry homogeneity on PEAD, documenting that the effect of industry homogeneity on PEAD is more pronounced for firms in high homogeneity industries which have less opacity in earnings information. Further, we document that our information transfer hypothesis holds regardless of the extent of industry concentration by showing that, even after controlling for industry concentration, as proxied by Herfindahl-Hirschman index on PEAD, industry homogeneity remains negatively related to PEAD.

Our research is valuable to academic researchers as well as practitioners. By connecting industry homogeneity in cost structure to market anomaly (i.e., post-earnings announcement drift), our study sheds light on another determinant factor which affects market efficiency regarding information processing. Moreover, by suggesting the importance of accounting consistency across firms to investor information processing capability, our paper provides the opportunity to overhaul accounting practices and regulation for each industry and to enhance investor informational efficiency.

## NOTE

1. Given that the median firm in our sample exhibits the 45-trading days cumulative abnormal returns of 0.002, the effect of a one-standard deviation from median value of HOGN on the magnitude of PEAD is  $-0.0034 = (0.087 + 0.137) \times -0.0154$  and this accounts for 1.72% of the cumulative abnormal returns of 0.002. In the same manner, as for cumulative abnormal returns for 60 -trading days following earnings announcement, the effect of a one-standard deviation from median value of HOGN on the magnitude of PEAD is  $-0.0039 = (0.087 + 0.137) \times -0.0174$  and this accounts for 1.29% of the cumulative abnormal returns of 0.003.

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