R&D expenditure and dividend smoothing: Evidence from Korean small and medium sized enterprises[1]

Min-Shik Shin
Kyungpook National University

Joong-Saeng Kwon
Kyungil University

Soo-Eun Kim
Kyungpook National University

ABSTRACT

This paper shows evidence that the innovative small and medium sized enterprises (SMEs) achieve dividend smoothing faster than the non-innovative ones, on the ground of their future growth opportunities and profitability following the R&D expenditure. This means the innovative SMEs can maintain more stable dividend policy than the non-innovative ones. The other result shows the innovative SMEs such as venture business, innobiz firm, and management innovative firm classified by the Korea Small and Medium Business Administration (SMBA) for policy purpose achieve dividend smoothing faster than the non-innovative ones. The additional result shows the innovative SMEs classified by policy purpose achieve dividend smoothing faster than the innovative ones classified by R&D intensity. In the context of dividend policy, these findings are encouraging evidences for various innovation policies of the Korea SMBA to support the innovative SMEs such as venture business, innobiz firm, and management innovative firm.

Keywords: R&D expenditure, Dividend smoothing, R&D intensity, Dividend policy

[1] This research is supported by Kyungpook National University Research Fund, 2010. The authors are grateful to Jaeshik Gong, Sunghwan Kim, seminar participants at the 2010 Korean Financial Management Association Conference, and anonymous referees for helpful comments and suggestions. The authors alone are responsible for all limitations and errors that may relate to the research.

INTRODUCTION

The small and medium sized enterprises (hereinafter SMEs) play important roles as driving forces for innovation and employment creation in the national economy. However, the SMEs cannot well adapt themselves to changing environment, because information collection, fund raising, labor productivity, and profitability of the SMEs are still weaker than the large firms. Fortunately, innovation and employment creation of the innovative SMEs are higher than the non-innovative ones because of the various supporting policies from government.

Although the innovative SMEs are similar to high-tech SMEs, they refer to SMEs with excellent innovation performance which can be measured by R&D intensity, R&D expenditure ratio, and submitted patent counts. Khan and Manopichetwattana (1989) classify the innovative SMEs and the non-innovative ones on the basis of manager's subjective criterion on innovation performance, but the innovative SMEs and non-innovative ones are classified on the basis of R&D intensity which is most frequently used as an objective criterion to measure innovation performance. Grabowski and Muller (1978) assert R&D expenditure plays an important role as the innovative driver that increases the future growth opportunities and profitability of the firms. Hence, Chan, Martin and Kensinger (1990), and Doukas and Switzer (1992) state R&D expenditure have positive and persistent effects on the market value of a firm.

Lintner (1956) estimates dividend adjustment speed using dividend adjustment model for the first time, and argues that past dividend per share and current earnings per share have important effects on dividend smoothing. He also defines dividend smoothing as firms adjust partially the dividend payment when actual dividend payout ratio deviates from target one, because it has mean-reverting property. Fama and Babiak (1968), Behm and Zimmerman (1993), Goergen, Renneboog and Correia da Silva (2005), and Aivazian, Booth and Cleary (2003) estimate dividend adjustment speed of firms.

This paper examines empirically the relations between R&D expenditure and dividend smoothing of the SMEs. The sample SMEs are classified by two methods. First, according to the method of Chauvin and Hirschey (1993), the sample SMEs are classified into the innovative SMEs and non-innovative ones on the basis of R&D intensity. The innovative SMEs are defined as the SMEs that have larger than median of R&D intensity, but the non-innovative ones are defined as the SMEs that have smaller than median of R&D intensity. Second, the sample SMEs are classified into the innovative SMEs and non-innovative ones on the basis of policy purpose. Korea Small and Medium Business Administration (hereinafter SMBA) classifies venture business, innobiz firm, and management innovative firm as innovative SMEs, and the other firms as the non-innovative ones. The dividend adjustment speed is estimated using Lintner (1956) dividend adjustment model (hereinafter 'Lintner model') and the expansion model which modifies Lintner model (hereinafter 'expansion model'). The innovative SMEs are expected to achieve dividend smoothing faster than the non-innovative ones, on the ground of their future growth opportunities and profitability following the R&D expenditure. The innovative SMEs such as venture business, innobiz firm, and management innovative firmare also expected to achieve dividend smoothing faster than the non-innovative ones, because they can receive many advantages from innovation policies that support credit guaranteed service, policy fund, venture investment fund, insurance program, and so on. On the ground of these findings, the implications for dividend policy of the innovative SMEs are presented.

The reminder of this paper proceeds as follows. Section 2 reviews the literature and develops hypothesis. Section 3 explains the details for research design, section 4 shows the empirical results, and section 5 presents conclusion and the limitations of this study. .

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Literature Review

Economists assert that innovation activities play an important role as driving forces for employment creation and economic development. Schumpeter (1912) claims that firms can increase business profits dramatically by creative destruction of production functions following various innovation activities. Baumol (2001) finds innovation has a positive effect on employment creation and economic development. In particular, the employment growth rate of the innovative SMEs is higher than the non-innovative ones. According to the research report (Lee, 2008) of Korea Small Business Institute, employment growth ratio of the innovative SMEs from 2002 to 2005 increases 6.2% annually which is 1.9% higher than the non-innovative ones.

Grabowski and Muller (1978), Chan et al. (1990), and Doukas and Switzer (1992) present the innovative SMEs show high future growth opportunities and profitability against the non-innovative ones, so the possibilities of excessive stock return are high either. Grabowski and Muller (1978) present the innovative SMEs achieve approximately 20% high profitability. Chan et al. (1990), and Doukas and Switzer (1992) assert R&D expenditure has a positive and persistent effect on the firm value. Blundell, Griffith and Van Reenen (1999) and Toivanen, Stoneman and Bosworth (2002) find out the bigger the firms' market share, the bigger the effect of R&D expenditure. In particular, Blundell et al. (1999) use R&D expenditure as an input factor for innovation, and patent counts as an output factor for it. Toivanen et al. (2002) assert R&D expenditure creates intangible assets which is the same as 'the storage of innovative knowledge'. Yang and Chen (2003) research the effects of R&D expenditure on the firm value in Taiwan. Reviewing these studies, it is assumed the future profitability, growth opportunities, and excessive stock return of the innovative SMEs is higher than the non-innovative ones.

Lintner (1956) estimates dividend adjustment speed using the dividend adjustment model for the first time. He argues that past dividend per share and current earnings per share have important effects on dividend adjustment speed, and firms adjust dividend payment partially when actual dividend payout ratio deviates from target one, because it has mean-reverting property. Fama and Babiak (1968) estimate dividend adjustment speed of American firms, and Goergen et al. (2005) do it for German firms. Aivazion et al. (2003) estimate dividend adjustment speed of firms in the emerging markets.

In this paper, the estimate dividend adjustment speed using Lintner model and expansion model. In the expansion model, explanatory variables are the past dividend per share and the current earnings per share which Lintner model suggests, and control variables are the dividend determinants which dividend theories suggest. Dividend theories are reviewed as below.

Miller and Modigliani (1961) argue the irrelevant theory that firm value is irrelevant to dividend policy on the assumption of the perfect capital markets. However, the practical capital markets have many imperfect elements such as tax, bankruptcy cost, financial distress, asymmetric information, agency cost, and clientele effects. Involving these imperfect elements one by one, various dividend theories are reviewed such as residual dividend theory, dividend signaling theory, agency theory, catering theory, and transaction cost theory. The expansion model of this paper uses dividend determinants as control variables.

The residual dividend theory asserts firms can pay dividend while cash balances is enough after capital expenditure is met. During a firm grows to growth stage, it is difficult to pay dividend. When capital expenditure increases, the cash balances for paying dividend decreases. Arriving at maturity stage, the firm's capital expenditure decreases, then cash balances increases. This implies that while a firm grows to growth stage, dividend payment can decrease. When leverage ratio and interest cost increase, then dividend payment decreases. However, high profitable firms increase cash balances deducting retained earnings, and they can cope with new investment opportunities positively. So the residual dividend theory expects capital expenditure and leverage ratio have negative effects on dividend payment, but profitability has a positive effect on it.

The dividend signaling theory argues dividend payment is a means of signaling information for the future firm value under the asymmetric information. Therefore, the change of dividend policy leads the change of future firm value. Dividend increase is a good news for future value, but dividend decrease is a bad one. So the stock price is changed by the signaling effects for future firm value than dividend itself. Bhattacharya (1979 asserts a firm considers dividend payment as a signal for cash flows, and Kale and Noe (1990) support the opinion that firm considers dividend payment as a signal for business risk. Hence the dividend signaling theory expects business risk has a negative effect on dividend payment.

The agency theory asserts that dividend payment is a means to solve the agency problem between managers and stockholders. Jensen (1986) argues dividend payment is a means for controlling the managerial opportunism, because dividend payment can reduce excessive cash flows. Jensen and Meckling (1976) assert stock holders interpret dividend payment as an expropriation of wealth from the debt holders, since dividend payment becomes the consequences of paying cash flows in advance that will pay the principal and interest to debt holders. Therefore, the agency theory expects capital expenditure and leverage ratio have negative effects on dividend payment, but profitability have a positive effect on it.

Miller and Modigliani (1961) argue the transaction cost theory that dividend policy has no relations with firm value, because investors can duplicate cash dividend by stock trading. That is, investors can duplicate cash dividend at low transaction costs in the stock markets, because they can realize capital gains by stock trading. When investors need cash, they can trade their holding stocks at low transaction costs while market liquidity is increasing. This leads the same effects as duplicating cash dividend using capital gains. Market liquidity can be a measure of turnover rate. While turnover rate increases, transaction costs decreases to duplicate cash dividend easy. Therefore, the transaction cost theory expects turnover rate has a negative effect on dividend payment.

Baker and Wurgler (2004) suggest the catering theory that dividend firm increase dividend payment as dividend premium accepting dividend increase for asking of investors. The stock price of dividend firm is estimated higher than non-dividend one. The gap of stock prices between dividend firm and non-dividend one reflects dividend premium. Dividend premium can be a measure of the difference of M/B (market value/book value of equity) ratios between dividend firm and non-dividend one. Therefore, the catering theory expects dividend premium has a positive effect on dividend payment.

Hypothesis Development

The researches for dividend policy are very active, but the study on the relations between R&D expenditure and dividend smoothing of the innovative SMEs is hard to find. Grabowski and Muller (1978), Chan et al. (1990), Doukas and Switzer (1992), Blundell et al. (1999), Toivanen, et al. (2002), and Yang and Chen (2003) present evidences that the innovative SMEs have higher future growth opportunities and profitability than the non-innovative ones. But there is not such research that the innovative SMEs achieve dividend smoothing faster than the non-innovative ones yet. So the research hypotheses are presented below.

H1: The innovative SMEs achieve dividend smoothing faster than the non-innovative ones, classified by R&D intensity.

R&D intensity is the most usable objective criterion to measure innovation, and it is measured as R&D expenditure divided by total sales. Blundell et al. (1999) use R&D expenditure as an input factor for innovation. According to the method of Chauvin and Hirschey (1993), the sample SMEs are classified into the innovative SMEs and the non-innovative ones on the basis of R&D intensity.

H2: The innovative SMEs achieve dividend smoothing faster than the non-innovative ones, classified by policy purpose.

Korea SMBA classifies venture business, innobiz firm, and management innovative firm as innovative SMEs, and the other firms as the non-innovative ones. Innobiz firm means technologically innovative business. Korea SMBA intensively fosters innobiz firm as a growth engine of the national economy by designating SMEs with technological competitiveness and growth potential as innobiz. Management innovative firm means the SMEs that endeavor to upgrade their productivity and create new values by innovating non-technological aspects of their business. The innovative SMEs such as venture business, innobiz firm, and management innovative firm are expected to achieve dividend smoothing faster than the non-innovative ones, because they can receive many advantages from innovation policies that support credit guaranteed service, policy fund, venture investment fund, insurance program, and so on.

H3: The innovative SMEs classified by policy purpose achieve dividend smoothing faster than the innovative ones classified by R&D intensity.

This paper compares the dividend smoothing effects between the innovative SMEs classified by policy purpose and the innovative ones classified by R&D intensity. That is, the innovative SMEs classified by policy purpose are expected to achieve dividend smoothing faster than the innovative ones classified by R&D intensity. If Hypothesis 3 is proved, it implies the innovation policies of Korea SMBA to support the innovative SMEs such as venture business, innobiz firm, and management innovative firm are very effective and successful.

REASEARCH DESIGN

Data

This paper collects the sample SMEs listed on Korea Exchange from 1999 to 2009 in the KIS Value Library database, and define the SMEs according to Article 3 Section 1 of the「Enforcement Decree of the Framework Act on Small and Medium Enterprises」. And the sample SMEs are collected according to the criterion as follows: (1) SMEs need to have complete financial reports from 1999 to 2009 since certain variables are lagged for a period of one fiscal year; (2) firms in financial industries (i.e., bank, securities, insurance, financial holding companies) are excluded due to their being subject to special financial regulations; (3) also excluded are M&A firms because of the continuity problems of financial data; (4) stock repurchase is involved in dividend payment, as Grullon and Michaely (2002) assert that stock repurchase and cash dividend has substitute relations each other.

The total number of firm-year of the sample SMEs that satisfies the above criteria from 1999 to 2009 is 6,776, the number of firm-year of the dividend SMEs is 3,339, and the number of firm-year of the non-dividend ones is 3,437. About 49% of total number of firm-year is the dividend SMEs sample. But the data structure is an unbalanced panel data, because there are no such requirements that the firm-year observations data are all available for every firm during the entire periods in the KIS Value Library database.

The dividend SMEs sample is classified by two methods. First, the dividend SMEs is classified into the innovative SMEs and the non-innovative ones on the basis of R&D intensity. According to the method of Chauvin and Hirschey (1993), the innovative SMEs are defined as the SMEs that have larger than median of R&D intensity, but the non-innovative ones as the SMEs that have smaller than median of R&D intensity, which is measured as R&D expenditure divided by total sales. The number of firm-year of the innovative SMEs is 1,317, and the number of firm-year of the non-innovative ones is 2,022, classified by R&D intensity.

Second, the sample SMEs is classified into the innovative SMEs and non-innovative ones on the basis of policy purpose. Korea SMBA classifies venture business, innobiz firm, and management innovative firm as innovative SMEs, and the other firms as the non-innovative ones. Venture business, innobiz firm, and management innovative firm are searched for on the websites as <www.venture-in.co.kr>, <www.innobiz.net>, <www.mainbiz.go.kr>. The number of firm-year of the innovative SMEs is 1,044, and the number of firm-year of the non-innovative ones is 2,295, classified by policy purpose.

Model and Variable

This paper examines the relations between technological innovation and dividend smoothing of the SMEs using the Lintner model. The core contents of the Lintner model is that under the assumption that firms maintain the target dividend payout ratio persistently, firms pay current dividend per share in proportion to current earnings per share. In other words, target dividend per share means paying like equation (1) (target dividend payout ratio×earning per share). This means that when current earnings per share changes, current dividend per share changes too.

$$\mathrm{DPS}^{*}_{i,t} = \Omega\,\mathrm{EPS}_{i,t} \tag{1}$$

where $\mathrm{DPS}_{i,t}$ and $\mathrm{DPS}^{*}_{i,t}$ denote dividend per share and target dividend per share of year t, respectively; $\mathrm{EPS}_{i,t}$ represents earnings per share of year t; Ω stands for target dividend payout ratio.

But Lintner (1956) argues that although earnings per share grow, firms do not implement the dividend increase immediately. They adjust dividend per share partially toward the target dividend payout ratio as shown in equation (2), when earnings per share grows up to the level assuring dividend increase.

$$\mathrm{DPS}_{i,t} - \mathrm{DPS}_{i,t-1} = \theta\left(\mathrm{DPS}^{*}_{i,t} - \mathrm{DPS}_{i,t-1}\right) = \theta(\Omega\,\mathrm{EPS}_{i,t} - \mathrm{DPS}_{i,t-1}) \tag{2}$$

where θ denotes dividend adjustment speed.

Now, the dividend adjustment speed is estimated by Lintner model as shown in equation (2). Under the assumption that firms partially adjust dividend per share toward target dividend payout ratio, the panel regression model is built like equation (3) with the firm-specific effects, time-specific effects and error term.

$$\mathrm{DPS}_{i,t} - \mathrm{DPS}_{i,t-1} = \beta_0 + \theta\left(\mathrm{DPS}^{*}_{i,t} - \mathrm{DPS}_{i,t-1}\right) + \mu_i + \lambda_t + \epsilon_{i,t} \tag{3}$$

where μ_i denotes firm-specific effects; λ_t represents time-specific effects; and $\epsilon_{i,t}$ is error term. It is assumed that firm-specific effects are unobservable but have significant effects on dividend adjustment. They differ across firms, but are fixed for a given firm over time. In contrast, time-specific effects vary over time, but are the same for all firms in a given year, capturing mainly economy wide factors that are outside the firm's control.

Equation (3) means that actual dividend per share change ($\Delta\mathrm{DPS}_{i,t} = \mathrm{DPS}_{i,t} - \mathrm{DPS}_{i,t-1}$) is the same as target dividend per share change ($\mathrm{DPS}^{*}_{i,t} - \mathrm{DPS}_{i,t-1}$) times dividend adjustment speed (θ). Dividend adjustment speed (θ) moves in range of $0 < \theta \leq 1$, where dividend adjustment speed $\theta=1$ means that adjustment of actual dividend per share toward target dividend per share is done immediately, but if dividend adjustment speed(θ) is close to 0, that means mostly no adjustment of actual dividend per share is done. These mean that actual dividend per share is partially adjusted toward target dividend per share ($\mathrm{DPS}_{i,t-1} \rightarrow \mathrm{DPS}^{*}_{i,t}$) as time goes ($t \rightarrow \theta$). But Aivazian et al. (2006) assert the financial unconstrained firms with high credit scores can do excessive adjustment. That is, the excessive adjustment ($1 < \theta$) beyond necessity can be done by dividend smoothing.

Equation (3) is changed as equation (4), which is transformed algebraically by using regression coefficients of past dividend per share, dividend adjustment speed and target dividend payout ratio. Even though Lintner model assume regression models such as equation (3) or (4), the equation (4) is preferred to equation (3).

$$\mathrm{DPS}_{i,t} = \beta_0 + \beta_1\mathrm{DPS}_{i,t-1} + \beta_2\mathrm{EPS}_{i,t} + \mu_i + \lambda_t + \epsilon_{i,t} \tag{4}$$

where β_1 in equation (4) equals $1-\theta$ in equation (3), that is, $\beta_1 = 1-\theta$, then $\theta = 1-\beta_1$.

Although equation (4) can be estimated with various regression models, the fixed effect model is applied to statistic tests such as Lagrange multiplier test and Hausman test. First, the firm-specific effects (μ) and time-specific effects (λ_t) are ascertained by the Lagrange multiplier test which Breusch and Pagan (1980) suggest, and check out that fixed effect model is more adequate than the random effect model by the Hausman test.

Dependent variable in equation (4) is dividend per share ($DPS_{i,t}$) that can be measured as [(year t total dividend payment)/(year t number of shares outstanding)]. Total dividend payment of year t can be measured as (year t cash dividend + year t stock repurchase), on the ground of substitution hypothesis between cash dividend and stock repurchase of Grullon and Michaely (2002). Although there are various dividend indices such as dividend per share, dividend payout ratio, and dividend yield, this paper use the dividend per share. In the Lintner model, dependent variable is current dividend per share ($DPS_{i,t}$), and independent variables are past dividend per share ($DPS_{i,t-1}$) and current earnings per share ($EPS_{i,t}$). Therefore, Lintner model can be interpreted as two variables dividend adjustment model, because it can explain current dividend per share using two variables such as past dividend per share and current earnings per share.

By the panel regression analysis, regression coefficient (β_1) of past dividend per share ($DPS_{i,t-1}$) is estimated, then dividend adjustment speed (θ) can be measured as 1 minus regression coefficient (β_1), that is, $\theta = 1 - \beta_1$. Target dividend payout ratio($\Omega = DPS^*_{i,t}/EPS_{i,t}$) in equation (1) means the ratio of target dividend per share divided by current earnings per share, and is measured as regression coefficient of current earnings per share divided by adjustment speed in the relations between equation (2) and (3), that is, $\Omega = \beta_2/\theta$. And then target dividend payout ratio(Ω) can be measured as $\Omega = \beta_2/\theta = \beta_2/(1 - \beta_1)$.

Next, equation (5) is the expansion model that modifies the Lintner model by including the determinants suggested by the major dividend theories such as residual dividend theory, dividend signaling theory, agency theory, catering theory, and transactions cost theory. In the expansion model, dependent variable is current dividend per share ($DPS_{i,t}$), explanatory variables are past dividend per share ($DPS_{i,t-1}$) and current earnings per share ($EPS_{i,t}$), and control variables are the determinants suggested by the dividend theories as shown in equation (5).

$$\begin{aligned} DPS_{i,t} = {} & \beta_0 + \beta_1 DPS_{i,t-1} + \beta_2 EPS_{i,t} + \beta_3 CEA_{i,t} + \beta_4 LEV_{i,t} + \beta_5 ROA_{i,t} + \beta_6 RISK_{i,t} \\ & + \beta_7 TURN_{i,t} + \beta_8 DPREM_{i,t} + \mu_i + \lambda_t + \epsilon_{i,t} \end{aligned} \tag{5}$$

where $CEA_{i,t}$, $LEV_{i,t}$, and $ROA_{i,t}$ denote capital expenditure ratio, leverage ratio, and profitability ratio of year t, respectively; $RISK_{i,t}$, $TURN_{i,t}$, and $DPREM_{i,t}$ represent business risk, turnover ratio, and dividend premium of year t, respectively. To eliminate the effects of scale, capital expenditure and profitability are normalized by the total assets.

Capital expenditure ratio ($CEA_{i,t}$) and leverage ratio ($LEV_{i,t}$) are expected to have negative effects on dividend payment as determinants suggested by residual dividend theory and agency theory. Capital expenditure ratio ($CEA_{i,t}$) as investment decision variable is measured as [(year t fixed asset - year t-1 fixed asset + year t depreciation cost)/(year t total assets)], and leverage ratio ($LEV_{i,t}$) is measured as [(year t total liabilities)/(year t total assets)]. While the leverage ratio ($LEV_{i,t}$) increase and interest cost increase too, then cash balances to pay dividend decrease.

Profitability ratio ($ROA_{i,t}$) is expected to have positive effect on dividend payment as determinant suggested by residual dividend theory, dividend signaling theory, and agency theory.

Profitability ratio ($ROA_{i,t}$) is measured as [(year t EBITDA)/(year t total assets)]. Business risk ($RISK_{i,t}$) is expected to have negative effect on dividend payment as determinant suggested by dividend signaling theory. According to Hamada (1972) model, business risk ($RISK_{i,t}$) is measured as [(year t beta coefficient/{1+(year t total liabilities)/(year t market equity)}], where market equity is defined as number of common shares outstanding times share price. Business risk can be measured as total risk minus financial risk using capital asset pricing model. According to Hamada (1972) model, the beta coefficient of levered firm reflects total risk such as business risk and financial risk. Hence, according to the method of Kale et al. (2006), because the beta coefficient of levered firm can be adjusted by the reciprocal of equity capital ratio, the business risk is measured only with eliminating financial risk from total risk.

Turnover ratio ($TURN_{i,t}$,) is expected to have negative effect on dividend payment as determinant suggested by transaction cost theory. Turnover ratio ($TURN_{i,t}$,) is measured as [(year t annual trading volume)/year t total number of shares outstanding)]. Dividend premium ($DPREM_{i,t}$) is expected to have positive effect on dividend payment as determinant suggested by catering theory. Dividend premium ($DPREM_{i,t}$) is measured as [ln(year t dividend firm M/B ratio)-ln(year t non-dividend firm M/B ratio)] according to the method of Kale et al. (2006), where M/B ratio is measured as [(year t total liabilities)+(year t market equity)/(year t total assets)].

EMPIRICAL RESULTS

Descriptive Statistics and Bivariate Results

Table 1 shows the descriptive statistics, correlation coefficients, and variance inflation factors among the variables. The mean of dividend per share and earnings per share is higher than each of their median, implying that DPS and EPS are skewed to the left. Also, the mean of capital expenditure ratio, leverage ratio, profitability ratio, business risk, turnover ratio and dividend premium are higher than each of their median. Hence, the distributions of the other variables such as CAPEX, LEV, ROA, RISK, TURN, and DPEAM are skewed to the left too.

As the Pearson (Spearman) correlation coefficients shows, earnings per share have positive and significant relations with dividend per share at the 1% level. Profitability ratio and dividend premium have positive and significant relations with dividend per share at the 1% level, but capital expenditure ratio, leverage ratio, business risk, and turnover ratio have negative and significant relations with dividend per share at the 5%, 1%, 1%, and 1% levels, respectively. Among the control variables, significant coefficients and insignificant ones are mixed up. Moreover, this paper test multicollinearity using the variance inflation factors (VIFs) among each variables, and identify the VIFs distribute in statistic allowance range. The highest correlation coefficient reported in Table 1 is 0.390(0.343) for Pearson (Spearman) correlations. This is below 0.8 and unlikely to lead to multicollinearity (Kennedy, 1992). Diagnostic tests confirm this conclusion with the highest VIF being 1.246.

Table 2 shows the results of mean difference tests between subsamples. Panel A presents the results of mean difference tests between the innovative SMEs and the non-innovative ones classified by R&D intensity. As the results show, all of dividend per share, earnings per share, capital expenditure ratio, profitability ratio, and business risk of the innovative SMEs are higher than the non-innovative ones at the 1% level, and both of leverage ratio and dividend premium are smaller at the 1% level, respectively. Therefore, these results identify the innovative SMEs are different from the non-innovative ones, which implies the innovative SMEs are better for dividend smoothing.

Panel B presents the results of mean difference tests between the innovative SMEs and the non-innovative ones classified by Korea SMBA for policy purpose. As the results show, all of dividend per share, earnings per share, capital expenditure ratio, profitability ratio, and business risk of the innovative SMEs are higher than the non-innovative ones at the 1% level, and both of leverage ratio and dividend premium are smaller at the 10% and 1% levels, respectively. Therefore, these results identify the innovative SMEs are different from the non-innovative ones, which imply the innovative SMEs are better for dividend smoothing.

The bivariate tests present the dividend smoothing of the innovative SMEs is a function of not just one factor, but rather multiple factors such as past dividend per share, current earnings per share, and the other dividend determinants. Because these factors may have interdependent effects that are not captured in bivariate tests, this paper take multivariate framework for full examinations of the determinants of dividend smoothing in the next section.

Multivariate Results

This section compares the dividend smoothing effects between the innovative SMEs and the non-innovative SMEs classified by R&D intensity applying Lintner model and expansion model, and also compare the dividend smoothing effects between the innovative SMEs and the non-innovative ones classified by policy purpose. Moreover, this section compares the dividend smoothing effects between the innovative SMEs classified by R&D intensity and the innovative ones classified by policy purpose.

Table 3 shows the comparing results of the dividend smoothing effects between the innovative SMEs and the non-innovative ones classified by R&D intensity. The firm-specific effects and time-specific effects are ascertained by the Lagrange multiplier test, and check out whether the fixed effect model is more adequate than the random effect model by the Hausman test.

As the results show, regression coefficients (β_1) of past dividend per share (DPS_{t-1}) for the innovative SMEs are estimated 0.247 and 0.302 in each of Lintner and expansion model, then dividend adjustment speeds ($\theta = 1 - \beta_1$) are measured as 0.753 and 0.698 each, implying that deviation between the actual dividend payout ratio and target dividend payout ratio is adjusted annually 75.3% and 69.8%, respectively. In addition, regression coefficient (β_1) of past dividend per share (DPS_{t-1}) in each of Lintner and expansion model are 0.247 and 0.302 respectively, which are much greater than regression coefficients (β_2) of current earnings per share (EPS_t) which show 0.026 and 0.021, respectively. This provides strong evidence that past dividend per share have greater explanatory power than current earnings per share in each of Lintner model and expansion model.

Among the control variables, capital expenditure ratio has a negative and significant effect on dividend per share at the 5% level, implying that dividend payment decreases as capital payment increases. Leverage ratio has a negative and significant effect on it at the 1% level. Profitability ratio has a positive and significant effect on it at the 1% level, indicating that dividend payment increases as profitability augments cash balances. But business risk has a negative and significant effect on it at the 5% level, which is consistent with the dividend signaling theory. Turnover ratio has a negative and significant effect on it at the 10% level, which is consistent with the transaction cost theory. Dividend premium has a positive and significant effect on it at the 10% level, which is consistent with the catering theory.

Comparing the dividend smoothing effects of the innovative SMEs and the non-innovative ones classified by R&D intensity, the dividend adjustment speeds for the former are faster than the latter in each of Lintner model and expansion model. According to the equality tests between regression coefficients, regression coefficients (β_1) of past dividend per share (DPS_{t-1}) for the innovative SMEs in each of Lintner model and expansion model are 0.247 and 0.302, which are lower than 0.333 and 0.345 for the non-innovative ones at the 1% and 5% levels, respectively. Thus the dividend adjustment speed ($\theta = 1 - \beta_1$) for the innovative SMEs in each of Lintner model and expansion model are 0.753 and 0.698, which are faster than 0.677 and 0.655 for the non-innovative ones at the 1% and 5% levels, respectively. Therefore, the **H1** that the innovative SMEs achieve dividend smoothing faster than the non-innovative ones classified by R&D intensity is proved. This means the innovative SMEs can maintain more stable dividend policy than the non-innovative ones, on the ground of future growth opportunities and profitability following R&D expenditure.

Next, Table 4 compares the dividend smoothing effects between the innovative SMEs such as venture business, innobiz firm, and management innovative firm classified by Korea SMBA for policy purpose and the non-innovative ones. As shown in Table 4, dividend adjustment speeds of the innovative SMEs in each of Lintner model and expansion model are faster than the non-innovative ones. According to the equality tests between regression coefficients, regression coefficients (β_1) of past dividend per share (DPS_{t-1}) for the innovative SMEs in each of Lintner model and expansion model are 0.204 and 0.258, which are lower than 0.409 and 0.447 for the non-innovative ones at the 5% and 10% levels, respectively. Thus dividend adjustment speed ($\theta = 1 - \beta_1$) for the innovative SMEs in each of Lintner model and expansion model are 0.796 and 0.742, which are faster than 0.591 and 0.553 of the non-innovative ones at the 5% and 10% levels, respectively. Therefore, the **H2** that the innovative SMEs achieve dividend smoothing faster than the non-innovative ones classified by policy purpose is proved. This means the innovative SMEs such as venture business, innobiz firm, and management innovative firm designated by the Korea SMBA for policy purpose achieve dividend smoothing faster than the non-innovative ones, because they can receive many advantages from innovation policies that support credit guaranteed service, policy fund, venture investment fund, insurance program, and so on.

Table 5 shows the comparing results of dividend smoothing effects between the innovative SMEs classified by R&D intensity and the innovative ones classified by policy purpose. As the results show, the dividend adjustment speeds of the innovative SMEs classified by R&D intensity in each of Lintner model and expansion model are slower than the innovative ones classified by policy purpose.

According to the equality tests between regression coefficients, regression coefficients (β_1) of past dividend per share (DPS_{t-1}) for the innovative SMEs classified by R&D intensity in each of Lintner model and expansion model are 0.247 and 0.302, which are higher than 0.204 and 0.258 for the innovative ones classified by policy purpose at the 10% levels, respectively. Thus dividend adjustment speed($\theta = 1 - \beta_1$) for the innovative SMEs classified by R&D intensity in each of Lintner model and expansion model are 0.753 and 0.698, which are slower than 0.796 and 0.742 of the innovative ones classified by policy purpose at the 10% levels, respectively. Therefore, the **H3** that the innovative SMEs classified by policy purpose achieve dividend smoothing faster than the innovative ones classified by R&D intensity is proved. This means the innovative SMEs such as venture business, innobiz firm, and management innovative firm achieve dividend smoothing faster than the innovative ones classified by R&D intensity. In other words, this implies the innovative SMEs classified by policy purpose can maintain more stable dividend policy than the innovative ones classified by R&D intensity. In the context of dividend policy, these findings are encouraging evidences for various innovation policies of the Korea SMBA to support the innovative SMEs such as venture business, innobiz firm, and management innovative firm..

CONCLUSIONS

This paper examines the relations between R&D expenditure and dividend smoothing of SMEs listed on the Korea Exchange. The sample SMEs are classified by two methods. First, the sample SMEs is classified into the innovative SMEs and non-innovative ones on the basis of R&D intensity. Second, the sample SMEs is classified into the innovative SMEs and non-innovative ones on the basis of policy purpose. The dividend adjustment speed is estimated by Lintner model and expansion model.

The main result shows evidence that the innovative SMEs achieve dividend smoothing faster than the non-innovative ones, on the ground of their future growth opportunities and profitability following the R&D expenditure. This means the innovative SMEs can maintain more stable dividend policy than the non-innovative ones. The other result shows the innovative SMEs such as venture business, innobiz firm, and management innovative firm classified by the Korea SMBA for policy purpose achieve dividend smoothing faster than the non-innovative ones, because they can receive many advantages from innovation policies that support credit guaranteed service, policy fund, venture investment fund, insurance program, and so on. The additional result shows the innovative SMEs classified by policy purpose achieve dividend smoothing faster than the innovative SMEs classified by R&D intensity. This means the innovative SMEs classified by policy purpose can maintain more stable dividend policy than the innovative ones classified by R&D intensity.

In conclusion, the past dividend per share and the current earnings per share suggested by the Lintner model explain mostly dividend smoothing of the innovative SMEs, and also R&D expenditure explains it partially. Therefore, if managers properly understand of the relations between R&D expenditure and dividend smoothing of SMEs, they can maintain stable dividend policy persistently. In the context of dividend policy, these findings are encouraging evidences for various innovation policies of the Korea SMBA to support the innovative SMEs such as venture business, innobiz firm, and management innovative firm.

This paper has a few limitations because it is the only early study about the relations between R&D expenditure and dividend smoothing of SMEs. In particular, this paper does not adequately capture all of the subtle features for the dividend policy of SMEs. Thus it is necessary to expand sample firms and control variables, and use more elaborate analytic methods in the future studies.

REFERENCES

Aivazian, V., L. Booth, and S. Cleary. 2003. Do emerging market firms follow different dividend policies from U.S. firms. *Journal of Financial Research,* 26(3): 371-387.

Aivazian, V., L. Booth, and S. Cleary. 2006. Dividend smoothing and debt ratings. *Journal of Financial and Quantitative Analysis,* 41(2): 439-453.

Baker, M., and J. Wurgler. 2001. A catering theory of dividends. *Journal of Finance.* 59(3): 1125-1165.

Baumol, M. 2001. The Free-Market Innovation Machine. Princeton U.P.

Behm, U., and H. Zimmermann. 1993. The empirical relationship between dividends and earnings in Germany. *Zeitschrift für Wirtschafts und Sozialwissenschaften,* 113(2): 225-254.

Bhattacharya, S. 1979. Imperfect information, dividend policy and the bird in the hand fallacy. *Bell Journal of Economics,*10(1): 259-276.

Blundell, R., R. Griffith. and J. Van Reenen. 1999. Market share, market value, and innovation in a Panel of British manufacturing firms. *Review of Economic Studies,* 66(3): 9-554.

Chan, S. H. J. D. Martin, and J. W. Kensinger. 1990. Corporate research and development expenditures and share value. *Journal of Financial Economics,* 26(2): 255-276.

Chauvin, K. W., and M. Hirschey. 1993. Advertising, R&D expenditures and the market value of the firm. *Financial Management*, 22(4): 128-140.

Doukas, J., and L. N. Switzer. 1992. The stock market's valuation of R&D spending and market concentration. *Journal of Economics and Business,* 44(2): 95-114.

Fama, E. F., and H. Babiak. 1968. Dividend policy of individual firms: An empirical analysis. *Journal of the American Statistical Association,* 63(4): 1132-1161.

Goergen, M.., L. Renneboog, and L. Correia da Silva. 2005. When do German firms change their dividends?. *Journal of Corporate Finance,* 11(1): 375-399.

Grabowski, H. G., and D. G. Mueller. 1978. Industrial research and development, intangible capital stocks, and firm profit rates. *Bell Journal of Economics,* 9(2): 328-343.

Grullon, G., and R. Michaely. 2002. Dividends, share repurchase, and the substitution hypothesis. *Journal of Finance*, 57(4): 1649-1684.

Hamada, R. S. 1972. The effect of the firm's capital structure on the systematic risk of common stocks. *Journal of Finance*, 27(2): 435-452.

Jensen, M. C., and W. H. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics,* 3(4): 305- 360.

Jensen, M.. 1986. Agency costs of free cash flow, corporate finance and takeovers. *American Economic Review,* 76(2): 323-329.

Kale, J., and T. Noe. 1990. Dividends, uncertainty, and underwriting costs under asymmetric information. *Journal of Financial Research,* 13(4): 265-277.

Kale, J., O. Kino, and J. Payne. 2006. On the dividend initiation decisions of newly public firms. *Working Paper*, Georgia State University.

Kennedy, P. 1992. A Guide to Econometrics. 3rd ed. Basil Blackwell, Oxford, UK.

Khan, A. M., and V. Manopichetwattana. 1989. Innovative and non-innovative small firms: Type and characteristics. *Management Science,* 35: 597-606.

Lee, D. J. 2008. The scheme of strengthening the connection of development policy for innovative SME. Korea Small Business Institute, Research Report, 07-25: 1-177.

Lintner, J. 1956. Distribution of incomes of corporations among dividends, retained earnings, and taxes. *American Economic Review*, 46(2): 97-113.

Miller, M., and F. Modigliani. 1961. Dividend policy, growth and the valuation of shares. *Journal of Business*, 34(3): 11-33.

Schumpeter, J. 1961. The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle. translated from the Germany by Redvers Opie, New York: OUP: 1912.

Toivanen, O., P. Stoneman, and D. Bosworth. 2002. Innovation and market value of UK firms, 1989-1995. *Oxford Bulletin of Economics and Statistics,* 64(1): 39-61.

Yang, C. H., and J. R. Chen. 2003. Patent and productivity: Evidence from the Taiwan manufacturing firms. *Taiwan Economic Review,* 30(4): 28-48.

TABLE 1: Descriptive Statistics, Correlation Coefficients, and Variance Inflation Factors

Variable	Mean	Standard Deviation	Median	DPS	EPS	CAPEX	LEV	ROA	RISK	TURN	DPREM	VIF
DPS	0.1873	0.2934	0.0909	1	0.343**	-0.085**	-0.182**	0.240**	-0.163**	-0.178**	0.216**	
EPS	0.4848	0.6218	0.3538	0.364**	1	0.022*	-0.183**	0.312**	-0.275**	-0.103**	-0.082*	1.149
CAPEX	0.0555	0.1415	0.0357	-0.042*	0.004	1	-0.030*	-0.096**	0.065**	-0.055**	0.133**	1.037
LEV	0.3833	0.1861	0.3831	-0.149**	-0.124**	-0.025	1	-0.033**	-0.158**	0.207**	0.022*	1.238
ROA	0.1954	0.0761	0.0925	0.182**	0.321**	-0.016	-0.115**	1	-0.225**	-0.293**	0.093**	1.164
RISK	0.3929	0.3102	0.3656	-0.053**	-0.019	0.078**	-0.390**	-0.016	1	0.145**	0.198**	1.246
TURN	0.2319	0.4296	0.1036	-0.131**	-0.149**	-0.031	0.084**	-0.128**	0.116**	1	0.289**	1.073
DPREM	-0.0140	0.6115	-0.0830	0.105**	-0.066**	0.166**	0.018	0.115**	0.134**	0.117**	1	1.094

Notes: Pearson(Spearman) correlation coefficients are reported below (above) the diagonal. ** and * denote statistical significance at the 1% and 5% levels, respectively, using a two-tailed test.

TABLE2: Mean Difference Tests between Subsamples

	Panel A: Mean Difference Test between Innovative SMEs and Non-innovative Ones, Classified by R&D Intensity			Panel B: Mean Difference Test between Innovative SMEs and Non-innovative Ones, Classified by Policy Purpose		
Variable	**Innovative SMEs**	Non-innovative SMEs	Mean Difference test	Innovative SMEs	Non-innovative SMEs	Mean Difference test
DPS	0.2087	0.1593	0.0494*** (4.298)	0.1025	0.0923	0.0102*** (2.774)
EPS	0.8556	0.6674	0.1882*** (3.149)	0.9237	0.5553	0.3684*** (8.287)
CAPEX	0.0641	0.0390	0.0251*** (4.705)	0.0658	0.0358	0.0300*** (5.024)
LEV	0.3550	0.4112	-0.0562*** (-8.073)	0.3861	0.3967	-0.0106* (-1.708)
ROA	0.1020	0.0924	0.0096*** (3.360)	0.1021	0.1020	0.0001*** (3.183)
RISK	0.4485	0.2959	0.1526*** (12.619)	0.4019	0.3271	0.0748*** (5.160)
TURN	0.2500	0.2322	0.0178 (1.039)	0.2215	0.2169	0.0046 (0.368)
DPREM	0.0904	0.1051	-0.0147*** (-10.011)	0.0511	0.1597	-0.1086*** (-15.271)

Notes: Parentheses are t-statistics, using a two-tailed test. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 3: Dividend Smoothing Effects between Innovative SMEs and Non-innovative Ones, Classified by R&D Intensity

Variable		**Innovative SMEs**		**Non-innovative SMEs**	
Variable Name	**Coefficient**	**Lintner Model**	**Expansion Model**	**Lintner Model**	**Expansion Model**
Constant	β_0	0.074***(19.74)	0.078***(8.73)	0.069***(21.12)	0.066***(8.90)
DPS_{t-1}	β_1	0.247***(11.62)	0.302***(11.17)	0.333***(10.30)	0.345***(10.67)
EPS_t	β_2	0.026***(3.31)	0.021***(3.24)	0.032***(3.62)	0.027***(3.53)
$CAPEX_t$	β_3		-0.041**(-1.98)		-0.016(-1.16)
LEV_t	β_4		-0.049***(-2.91)		-0.019(-1.52)
ROA_t	β_5		0.165***(4.34)		0.128***(3.81)
$RISK_t$	β_6		-0.067**(-2.13)		-0.038**(-2.01)
$TURN_t$	β_7		-0.017*(-1.77)		-0.016*(-1.86)
$DPREM_t$	β_8		0.013*(1.76)		0.015*(1.82)
Adjustment Speed (θ)	$1-\beta_1$	0.753	0.698	0.677	0.655
Number of Observations (n)		1,317	1,317	2,022	2,022
Number of Firms (g)		318	318	426	426
R^2 − Within		0.1467	0.2005	0.2067	0.2293
R^2 − Between		0.4434	0.3623	0.4174	0.4339
R^2 − Overall		0.1932	0.2205	0.2502	0.2621
Lagrange Multiplier Test		19.06***	16.79***	21.29***	23.11***
Hausman Test		59.49***	159.11***	26.85***	21.56***
Wald Test(F-value)		135.12***	179.25***	252.51***	165.34***
Regression coefficients Equality Test(t-value)		H_0: Innovative SMEs(β_1)-Non-innovative SMEs(β_1)=0 Lintner Model: -0.086(-3.17)*** Expansion Model: -0.043(-2.45)**			

Notes: Parentheses are White-corrected t-statistics, calculated using heteroskedasticity-consistent estimates of the standard errors. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed test.

Journal Finance & Accountancy

TABLE 4: Dividend Smoothing Effects between Innovative SMEs and Non-innovative Ones, Classified by Policy Purpose

Variable		Innovative SMEs		Non-innovative SMEs	
Variable Name	**Coefficient**	**Lintner Model**	**Expansion Model**	**Lintner Model**	**Expansion Model**
Constant	β_0	0.083***(18.41)	0.084***(8.15)	0.062***(21.51)	0.061***(8.54)
$\mathbf{DPS_{t-1}}$	β_1	0.204***(5.26)	0.258***(5.33)	0.409***(13.81)	0.447***(13.33)
$\mathbf{EPS_t}$	β_2	0.005**(2.50)	0.001**(2.28)	0.001*(1.79)	0.001*(1.76)
$\mathbf{CAPEX_t}$	β_3		-0.062**(-2.35)		-0.014(-1.04)
$\mathbf{LEV_t}$	β_4		-0.052***(-3.23)		-0.013(-1.03)
$\mathbf{ROA_t}$	β_5		0.188***(4.00)		0.109***(3.42)
$\mathbf{RISK_t}$	β_6		-0.065*(-1.95)		-0.035*(-1.87)
$\mathbf{TURN_t}$	β_7		-0.021**(-2.35)		-0.015*(-1.86)
$\mathbf{DPREM_t}$	β_8		0.009(0.97)		0.013*(1.70)
Adjustment Speed (θ)	$1-\beta_1$	0.796	0.742	0.591	0.553
Number of Observations (n)		1,044	1,044	2,295	2,295
Number of Firms (g)		198	198	351	351
$\mathbf{R^2}$ **– Within**		0.2647	0.2145	0.1791	0.1820
$\mathbf{R^2}$ **– Between**		0.3899	0.3114	0.7889	0.7320
$\mathbf{R^2}$ **– Overall**		0.1622	0.1984	0.1637	0.1738
Lagrange Multiplier Test		29.98***	29.82***	13.05***	15.67***
Hausman Test		38.07***	112.59***	22.90***	26.57***
Wald Test(F-value)		29.77***	82.97***	197.15***	229.07***
Regression coefficients Equality Test(t-value)		H_0:Innovative SMEs(β_1)-Non-innovative SMEs(β_1)=0 Lintner Model: -0.205(-2.31)** Expansion Model: -0.189(-1.78)*			

Notes: Parentheses are White-corrected t-statistics, calculated using heteroskedasticity-consistent estimates of the standard errors. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed test.

Journal Finance & Accountancy

TABLE 5: Dividend Smoothing Effects between Innovative SMEs Classified by R&D Intensity and Innovative SMEs Classified by Policy Purpose.

Variable		**Innovative SMEs Classified by R&D Intensity**		**Innovative SMEs Classified by Korea SMBA for Policy Purpose**	
Variable Name	**Coefficient**	**Lintner Model**	**Expansion Model**	**Lintner Model**	**Expansion Model**
Constant	β_0	0.074***(19.74)	0.078***(8.73)	0.083***(18.41)	0.084***(8.15)
DPS_{t-1}	β_1	0.247***(11.62)	0.302***(11.17)	0.204***(5.26)	0.258***(5.33)
EPS_t	β_2	0.026***(3.31)	0.021***(3.24)	0.005**(2.50)	0.001**(2.28)
$CAPEX_t$	β_3		-0.041**(-1.98)		-0.062**(-2.35)
LEV_t	β_4		-0.049***(-2.91)		-0.052***(-3.23)
ROA_t	β_5		0.165***(4.34)		0.188***(4.00)
$RISK_t$	β_6		-0.067**(-2.13)		-0.065*(-1.95)
$TURN_t$	β_7		-0.017*(-1.77)		-0.021**(-2.35)
$DPREM_t$	β_8		0.013*(1.76)		0.009(0.97)
Adjustment Speed (θ)	$1-\beta_1$	0.753	0.698	0.796	0.742
Number of Observations (n)		1,317	1,317	1,044	1,044
Number of Firms (g)		318	318	198	198
R^2 – Within		0.1467	0.2005	0.2647	0.2145
R^2 – Between		0.4434	0.3623	0.3899	0.3114
R^2 – Overall		0.1932	0.2205	0.1622	0.1984
Lagrange Multiplier Test		19.06***	16.79***	29.98***	29.82***
Hausman Test		59.49***	159.11***	38.07***	112.59***
Wald Test(F-value)		135.12***	179.25***	29.77***	82.97***
Regression coefficients Equality Test(t-value)		H_0: Innovative SMEs by Intensity(β_1)-Innovative SMEs by Policy Purpose(β_1)=0 Lintner Model: 0.045(1.77)* Expansion Model: 0.043(1.79)*			

Notes: Parentheses are White-corrected t-statistics, calculated using heteroskedasticity-consistent estimates of the standard errors. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, using a two-tailed test.