

## Article

# International Strategy, R&D Intensity, and Sustainable Earnings of Biotech Firms

Jaehong Lee <sup>1</sup>  and Young Soo Yang <sup>2,\*</sup><sup>1</sup> College of Business, Sangmyung University, Seoul 03016, Korea<sup>2</sup> Leeds University Business School, University of Leeds, Leeds, LS2 9JT, UK

\* Correspondence: Y.S.Yang@leeds.ac.uk

Received: 16 July 2019; Accepted: 28 August 2019; Published: 2 September 2019



**Abstract:** For a relatively small country such as Korea to successfully establish its presence in the global biotech industry, it must pair a successful domestic model with an effective export strategy. However, there are little empirical findings on the relationship between biotech firms' internationalization strategy, research and development (R&D) intensity, and sustainable earnings. Thus, we explore this often overlooked area by analyzing the relationship between the international strategies and sustainable earnings of biotech firms. By using a sample of 29,583 firm-year observations in South Korea between 2000 and 2017, this study analyzes the association between internationalization strategy and sustainable earnings. Findings from the analysis show that internationalization strategy has a negative impact on biotech firms. However, the impact of international strategy on sustainable earnings of a biotech firm is observed to be positively influenced by R&D intensity. This study contributes to the research on the determinants of sustainable earnings by empirically proving that biotech firms' internationalization strategy with high R&D investments leads to an increase in earnings sustainability.

**Keywords:** internationalization strategy; R&D intensity; sustainable earnings; biotech industry

## 1. Introduction

The role of the biotech industry in the Korean economy has rapidly increased in importance. The Korean government has responded by actively supporting the industry and setting a goal to become a major force in biotech by 2022 [1]. In 2019 alone, the government plans to promote innovation by investing over \$2.5 billion in biotech research and development (R&D) as well as the process of making successful products commercially viable. That amount is a nearly 3% increase from its 2018 investment, with significant contributions from the ministries of science, education, and health. In addition, to government funding, the private sector is also expected to heavily invest in biotech as well [2].

Since Korea has a relatively small domestic market, it is crucial in terms of long-term sustainable growth for firms to pursue overseas business opportunities. In particular, the biotech industry, which is the center of Korea's next-generation core engine industry, cannot generate sufficient sales required to recover high R&D costs if they operate only in a single market such as Korea [3]. Therefore, for the sustainable growth of the domestic biotech industry, it is necessary to develop innovative new products and generate profits by pioneering global markets.

Fortunately, biotech firms have started to actively pursue the internationalization strategy through licensing. In 2018, Korean biotech firms agreed to 11 international out-licensing deals worth approximately \$4.7 billion, nearly quadrupling the total value of such deals made the year before [1]. That is to say, the long-term growth model of domestic biotech firms is moving beyond the domestic market to create demand through international market exploration. Despite this importance, research on the internationalization of biotech firms has been very limited.

Meanwhile, in a knowledge-intensive industry where technological change is rapid, the ability of firms to innovate creates an important influence on the firm's sustainable competitive advantage [4]. In this regard, researches have been conducted on R&D investment for innovation creation capability, competitive advantages, and performance [5,6]. Internationalization strategy and R&D activities are considered to be two main activities carried out for a firm's innovation [5]. Given the fact that these two activities are inherently a trade-off in nature, it is not easy for a firm with limited resources to put resources into both activities at the same time.

The biotech industry is, by definition, a high-tech industry, which means it changes quickly and rewards entrepreneurialism and innovation [7]. R&D in the biotech industry is particularly high-risk, and commercialization of the results is often time-consuming [8,9], and the market for those products is continuously becoming more globalized [10]. For a relatively small country such as Korea to successfully establish its presence in the global biotech industry, it must pair a successful domestic model with an effective export strategy.

In sum, the relationship between biotech firms' internationalization strategy, R&D intensity, and sustainable earnings have garnered little empirical findings or remained a puzzle. While there is evidence regarding the performance implication of internationalization strategy, little attention has been given to internationalization strategy of biotech firms and their association with sustained performance. In examining the role of internationalization strategy on sustained performance of biotech firms, regarding an important exception, a study by Qian and Li [3] analyzed the impact of innovator position, market awareness, niche operation, and internationalization on the performance of small and medium-sized firms in biotechnology industries. The results showed a positive relationship between internationalization and profitability of small and medium-sized firms in biotechnology industries, but there are limitations in that the research subject is limited to small and medium-sized firms only and they did not consider the sustainable aspects of performance.

Thus, this study analyzes the effect of international strategy and R&D intensity on biotech firms' sustainable earnings using data on Korean biotech firms. In this article, we argue that the internationalization strategy of a biotech firm is negatively related to sustainable earnings but pursuing an internationalization strategy with a high level of R&D intensity is positively related to sustainable earnings of a biotech firm. This may imply that in the case of biotech firms, internationalization strategy is not the core strategy for sustaining earnings. Therefore, merely pursuing internationalization strategy would not have positive performance implication for the biotech firms. Instead, biotech firms should constantly focus on R&D and simultaneously pursue internationalization strategy for sustainable earnings.

Our analysis produced two primary findings. First, we found a negative relationship between international strategy and sustainable earnings for biotech firms. Second, the impact of international strategy on sustainable earnings of a biotech firm was observed to be positively influenced by R&D intensity. After conducting several additional tests, we saw that the main findings are still valid by the fixed-effect panel regressions in estimating specifications. Furthermore, our analysis shows that the relationship between internationalization strategy, R&D intensity, and sustainable earnings in biotech firms is consistent with alternative measures of earnings sustainability. Finally, R&D intensity only has a moderating effect on the relationship between sustainable earnings and international strategy in the mature stage. Since biotech firms suffer from sluggish profitability due to large-scale investment in R&D and relatively long-term life cycle in the industry, the positive outcomes from implementing the international strategy while maintaining a high level of R&D investment are possible for firms in a mature state. Ultimately, this study offers the important fact that pursuing internationalization strategy while maintaining a high level of R&D intensity improves the overall sustainable earnings for biotech firms.

This study makes two important contributions to the literature in at least two ways. First, this paper examines the relationship between the internationalization strategy of biotech firms and their impact on sustainable earnings which have not been examined in previous studies. Second, while previous

researches provide some evidence of the impacts of R&D intensity and/or internationalization on the performance of the firm, we further provide evidence for how such relationships exist using the data of biotech firms. We show that R&D investment is the key strategy for biotech firms and maintaining R&D investment while pursuing international strategy is the best way to improve sustainable earnings. This study's implications are important for biotech firms and biotech firms in countries similar in size to Korea.

This paper is divided into four additional sections. In Section 2, we review previous literature on internationalization strategy, R&D intensity, and its performance implications. Based on that literature, we then present our hypotheses. In Section 3, we share our research design and explain the dataset that was used to test our hypotheses. A summary of regression analysis and the subsequent results are reported in Section 4 and serve as support for our hypotheses. In this section, we also describe additional tests that were conducted, and we discuss the results of our analysis as well as their implications. Finally, we conclude in Section 5, in which we suggest potential ways to expand upon this research.

## 2. Backgrounds and Hypotheses

### 2.1. International Strategy

Internationalization is recognized as an important means of corporate growth and sustained profit creation among corporate strategies. Due to this importance, many researchers are making efforts to identify the relationship between internationalization and performance [11]. However, empirical studies of firms' internationalization and performance show mixed results and fail to produce consistent conclusions [12]. Some studies have shown a positive relationship between internationalization and performance, but some studies have reported negative relationships, S-curves, U-shapes, and inverted U-shapes [11–18].

Generally, previous researches on internationalization and performance relationship support a positive relationship between the two [3,11]. International strategies offer benefits such as economies of scale, economies of scope, learning opportunities, and the sharing of core competencies and as firms expand into international markets to exploit more resources, this leads to higher performance [13].

However, some studies show a negative relationship between internationalization strategy and performance of a firm. For instance, Denis et al. [14] found a negative relationship between internationalization and performance and argued that the costs of internationalization strategy outweigh the benefits. Lu and Beamish [17] investigated the effects of internationalization on small and medium-sized enterprises (SMEs) performance using a sample of 164 Japanese SMEs and found a U-shape relationship. The U-shape relationship of internationalization strategy and performance showed the inherent costs associated with internationalization, especially at the early stage of internationalization strategy. Lu and Beamish [17] found that internationalization strategy and performance had an S-curve relationship which showed that in the early stage of internationalization, performance decreases as internationalization progresses, but performance decreases when the internationalization level is high. Also, Hitt et al. [16] found the inverted U-shape association between internationalization and performance.

All those studies regarding internationalization and performance showed the existence of cost associated with internationalization strategy (e.g., coordination cost, governance cost, information processing cost, and the liability of foreignness) and benefits of internationalization strategy. In addition, the results of inconsistent previous studies imply that the impact of internationalization on performance is influenced by a variety of situational factors, and it depends on the industry to which the firm belongs, and the core strategies that the firms take [13,15].

Since the impact of internationalization strategy on firm performance occurs after time passes, the benefits of internationalization may not be directly reflected in the performance of the firm if the performance is measured only by short-term performance. Therefore, it is important to measure and

analyze long-term performance such as sustainable earnings to grasp the effect of internationalization strategy on performance more accurately.

## 2.2. R&D Intensity

Many firms are investing in R&D activities more and more because the technology revolution and innovation is a key factor in enhancing competitiveness and long-term sustainable growth in this era [6,19]. The competitive advantage of biotech firms lies in a deep knowledge base of biochemical processes and innovativeness [20].

The biotech industry is a high-tech industry where technology is particularly important, and continuous R&D spending is very important [21]. However, innovation activities such as R&D investments have characteristics such as being long-term, high-risk, and difficult to predict future profitability [6,11].

In this aspect, considerable prior research has investigated the implications of R&D intensity on the firms' performance. For instance, previous literature generally supports a positive association between R&D intensity and firm performance in sales growth, market value or firm value [3,6,22]. However, previous empirical results on R&D intensity and firm performance have been mixed with other research studies that have found negative results. For instance, Vithessonthi and Racela [5] tested R&D intensity on firm performance using non-financial firms listed on the US stock exchange and showed that there is a negative relationship between R&D intensity and operating performance.

Furthermore, though other research has explored the ways in which firm performance is affected by internationalization and R&D, the results have been inconsistent, suggesting a complicated relationship [5]. Such a relationship exists between internationalization strategy and R&D because the direct and combined effects of R&D and internationalization is context-specific [5], which raises the need to examine the biotech industry in Korea.

## 2.3. International Strategy, R&D of Biotech Industry

Prior studies on the biotech firms' internationalization strategies generally focused on the following topics. Research by Bialek-Jaworska and Gabryelczyk [23] reported on the business model determinants and associated features of biotech spin-off activity, which are crucial factors in implementing the internationalization strategy. The study documented that not only international cooperation in research projects and partnering but also international experience in the management board and tacit knowledge take a facilitating role in the business model for the commercialization of biotech spin-off research outcomes. Another stream of research examined the internationalization of R&D activity. They reported that the internal R&D determinants encouraging a firm to invest in R&D overseas is owning R&D performing affiliates abroad [24]. Additionally, the findings found that a higher share of R&D internationalization is associated with a more structured organization of R&D at homes, such as performing R&D in dedicated laboratories and the propensity to outsource R&D to foreign non-affiliated partners. Kale [25] demonstrated its collaboration with multinational corporation (MNC), which revealed internationalization in the form of acquisitions of foreign firms and has formed the core foundation of the technology upgrade strategy for Indian firms. Veilleux and Roy [26] explored through strategic alliances how corporate and scientific advisory boards participate in the internationalization of biotechnology firms. Using semi-structured interviews and secondary data from 22 biotech firms, this study showed the nature of this external strategic advice and examined their impact on the internationalization of the firms. Rahko [27] investigated how innovations change when European firms start to internationalize their R&D activities and the results showed that the start of R&D internationalization further increased firms' innovative output.

The above studies provide important insights into the inter-relationship between internationalization related strategy and R&D of biotech firms, however, they have not examined the direct relationship between sustained performance and internationalization strategy, and the moderating effect of R&D strategy.

Though some research has been conducted on the performance implications of an internationalization strategy, few studies have focused on the internationalization strategies of biotech firms in particular and the relationship between those strategies and sustainable earnings. In a rare and important study on this subject, Qian and Li [3] examined the effects that niche operation, market awareness, innovator positioning, and internationalization had on small and medium-sized biotech firms. The authors found that, among those small and medium-sized biotech firms, internationalization was positively related to profitability. However, that study was limited in that it analyzed only small and medium-sized biotech firms and did not consider sustainability. Our study expands upon previous research by employing a new measure of sustainable earnings, namely, the persistence of earnings. While other measures of profitability represent a specific moment in time, the persistence of earnings is a flow variable measured over time, making it more representative of sustainability and less vulnerable to manipulation.

#### 2.4. Hypothesis Development

Many researchers argue that if a firm has a competitive advantage, it will have a positive impact on the performance of the firm if it is internationalized [5,13,28,29]. By pursuing internationalization strategy firms can enjoy the following benefits.

First, when a firm enters the international market, the firm can enjoy economies of scale by lowering production costs because production and sales volume increase [30,31]. Internationalization plays an important role in ensuring the competitiveness of a firm as a means of achieving economies of scale in functional areas such as marketing costs and R&D expenses, as well as reducing the cost of firms due to economies of scale [32].

Second, firms can maximize the location advantage and benefit from the difference in factor markets by placing value chain activities around the world [11]. The difference between different factor markets in different countries is providing firms with opportunities to improve overall profitability by restructuring their operations to lower costs [33].

Third, if there is a limit to the growth of the domestic market, the effect of risk diversification can be anticipated from the perspective of the firm as it can enjoy sustained growth through building a foundation in the international market [34].

In short, internationalization strategy provides the opportunity for exploring a new or niche market, spreading fixed costs of R&D or marketing, and exploiting location-specific advantages which all lead firms to increase sales and competitiveness [29].

All these arguments support the view that there is a positive and linear relationship between internationalization strategies and corporate performance. However, we argue that the relationship between international strategy and sustainable earnings for biotech firms is somewhat different than for manufacturing firms. In contrast to a positive relationship between international strategy and sustainable earnings, which has been the premise and evidence in prior researches, we argue that the relationship is a negative relationship for biotech firms.

Internationalization of firms is exposed to the cultural and institutional environment of various countries, and due to the liability of foreignness, there is an additional cost to dealing with the foreign market environment [11]. While this logic applies to non-biotech firms, the cost of dealing with internationalization, which is essentially required for biotech firms, will be higher than that of non-biotech firms. For biotech firms, the key strategy for innovation is the R&D investment strategy [35], and the firm's main value chain activities will be focused on R&D strategies. Therefore, high levels of complexity resulting from pursuing an internationalization strategy may worsen performance [5].

In this sense, the increasing level of internationalization of biotech firms implies that transaction costs, governance costs, and information processing demands increase [13]. Owing to the complexity of internationalization strategy operations, a high level of internationalization of a biotech firm can have a negative impact on sustainable earnings.

Also, firms generally have limited resources to implement strategies, it is not easy to pursue all strategies at the same time, and trade-off exists between them [5]. For implementing the



internationalization strategy, a firm has to make a considerable level of investment, the higher the commitment to internationalization strategy, the lower the possibility of putting that resource into a R&D capacity. This could have a negative impact on sustainable earnings for biotech firms.

**Hypothesis 1 (H1).** *The level of internationalization of a biotech firm has a negative effect on sustainable earnings.*

The second hypothesis expands the first hypothesis and analyzes the moderating effect of R&D intensity on the relationship between internationalization strategy and sustainable earnings. While internationalization strategy has a negative effect on sustainable earnings for a biotech firm, we contend that if a biotech firm's R&D intensity is high, the sustainable earnings will improve.

Previous research has shown that when firms are internationalized, they are exposed to learning opportunities for innovation, which ultimately has a positive impact on performance [36] and by receiving information and feedback from customers and partners in foreign markets through internationalization, such as exports, companies can apply this knowledge to innovation [5]. Biotech firms need to sell their products in as many markets as possible in order to distribute their enormous R&D costs across more products, and internationalization strategy is beneficial in this respect [3] because long-term profitability improvement through market expansion can be expected.

Indeed, as multinational corporations increase their overseas business activities, their corporate value increases [37] and investors tend to appreciate overseas profits relatively more because their growth potential in overseas markets is larger than the domestic market [38]. Therefore, it can be expected that biotech firms will have a positive R&D intensity and will adjust their relationship to sustainable earnings if they are internationalized. In fact, corporate value increases as multinational companies increase their overseas business activities [37], and investors tend to appreciate overseas profits relatively more because their overseas markets are more likely to grow than their domestic counterparts [38]. Also, because the biotech industry is rapidly shortening its lifecycle, a biotech firm must maximize their sales as quickly as possible by exploiting new products developed overseas [3].

Many biotech firms have suffered for a long time from sluggish earnings due to large-scale investment in R&D. Still, there is a reason why firms are investing in R&D. This is because the scale of compensation for internationalization through technology exports is enormous. For example, Yuhan, a representative biotech firm in Korea, contracted an exporting contract with Boehringer Riegelheim, a global pharmaceutical company, in 2019. The contract, worth \$870 million, was for a fusion protein technology used to treat non-alcoholic steatohepatitis [39]. In the past year, Yuhan has completed a total of four new drugs. Through the contract for the candidate material, the export of technology amounted to 3.3 trillion won. Yuhan has continued to invest in the most important R&D investment in the future growth engine in recent years and steadily increasing its R&D investment is a big factor in its success. In other words, while maintaining a high level of R&D investment, it is possible to improve profitability by opening up overseas markets and expanding the market. In fact, innovation capability through R&D investment is a key success factor to succeed in the global market [11].

Thus, we anticipate that biotech firms pursuing an internationalization strategy with a high level of R&D intensity is positively related to sustainable earnings of a biotech firm.

**Hypothesis 2 (H2).** *R&D intensity positively moderates the effect of the level of the internationalization on a biotech firm's sustainable earnings.*

### 3. Research Design and Sample Description

#### 3.1. Research Model and Measurement of Variables

To test Hypothesis 1, the study analyzes the correlation between corporate international strategy and earnings persistency while using firm-level control variables in the following ordinary least squares (OLS) regression model [35,40,41].

$$SUSROA_{5yrs,t} = \beta_0 + \beta_1 INTER_{i,t} + \beta_2 INTER\_BIO_{i,t} + \beta_3 SIZE_t + \beta_4 LEV_t + \beta_5 MTB_t + \beta_6 GROWTH_t + \beta_7 CFO_t + \sum \beta_j IND_j + \sum \beta_k YEAR_k + \varepsilon_{i,t} \quad (1)$$

where  $SUSROA_{5yrs,t}$  is persistence of return on asset (ROA), which is a proxy of sustainable earnings. In this study, sustainable earnings are measured by the persistence of earnings, a flow variable. Whereas stock quantities, such as market value, earnings, and financial ratios, are measured at a specific point in time, flows are measured over a period of time. Stocks can temporarily be manipulated relatively easily by things such as accrued expenses and deferred revenues, which may cause investors to misjudge the sustainability of a firm. The persistence of earnings, on the other hand, more accurately measures sustainability by taking a broader view of a firm's performance, which also makes manipulation more difficult. Overall, the persistence of accounting earnings is more sustainable due to the fact that it has little space for intentional manipulation of financial statements. Following Sloan [40] and Francis et al. [41], sustainable earnings are estimated using the rolling five-year-period time series data for each firm-year. Specifically, to measure  $SUSROA_{5yrs,t}$  for each firm-year, the study employs the following regression model and estimated the coefficient  $\beta_1$ . Here, ROA is measured as net income divided by total assets.

$$ROA_{t+1} = \beta_0 + \beta_1 ROA_t + \varepsilon_t \quad (2)$$

In line with prior studies in Hsu et al. [42],  $INTER_{i,t}$  is used to measure the level of internationalization of a firm. It is computed as the ratio of foreign sales to total sales (in %).  $INTER\_BIO_{i,t}$  indicates the level of internationalization for biotech firms. The above model includes control variables that can affect earnings sustainability. These variables are size ( $SIZE$ ), leverage ( $LEV$ ), market-to-book ( $MTB$ ), sales growth ( $GROWTH$ ), and operating cash flows ( $CFO$ ).  $SIZE$ , which is measured as the natural logarithm of the total assets, is involved to control for the size effects. Since prior studies show a strong relation between the firm size and operating performance,  $SIZE$  may have a significant positive or negative association with operating performance [43]. We include  $LEV$ , representing financial leverage, which is calculated as total liability divided by total assets. The financial leverage ratio ( $LEV$ ) is included to control for the leveraged firms' strong incentives for managing corporate earnings [44]. The study also includes the market-to-book ratio ( $MTB$ ) and sales growth ( $GROWTH$ ) in order to control for the corporate growth potential, which can affect return on assets (ROA). Market-to-book ratio is measured as the market value of the equity divided by its book value [45]. Sales growth is the difference in sales from the previous year divided by the previous year's sales.  $CFO$ , operating cash flows divided by assets, is included to control liquidity. Finally, industry fixed effect dummies and year fixed dummies are included to mitigate the industry and year effects on the earnings sustainability.  $IND_{i,t}$  implies the industry fixed effects, and  $YEAR_{i,t}$  is the year indicator variable.

We examine Hypothesis 2 to determine if the effect of corporate international strategy is dependent upon the R&D intensity. To conduct the analyses, we use the ordinary least squares (OLS) regression model below:

$$SUSROA_{5yrs,t} = \beta_0 + \beta_1 INTER_{i,t} + \beta_2 INTER\_BIO_{i,t} + \beta_3 INTERRD_{i,t} + \beta_4 INTERRD\_BIO_{i,t} + \beta_5 SIZE_t + \beta_6 LEV_t + \beta_7 MTB_t + \beta_8 GROWTH_t + \beta_9 CFO_t + \sum \beta_k IND_k + \sum \beta_l YEAR_l + \varepsilon_{i,t} \quad (3)$$

where  $INTERRD$  is an interaction between the level of international strategy and R&D intensity, and  $INTERRD\_BIO$  is the interaction between  $INTERRD$  and  $BIO$ , the biotech variable. R&D intensity is measured by the total R&D expenditures divided by sales. Biotech firms indicate both biopharma and biotech firms. Control variables are consistent with the regression model in Hypothesis 1.

### 3.2. Sample Selection

The sample includes companies listed on the Korea Stock Exchange (KSE) and Korea Securities Dealers Automated Quotation (KOSDAQ) market as of 31 December 2017 that satisfies the subsequent conditions: (1) companies (except financial institutions) listed on the KSE and KOSDAQ market

with accounts closing in December and (2) companies with financials in the FnGuide database. Each industry is denoted by its two-digit industry code, and the study only included industries with at least 20 observations in each industry-year group, so as to decrease bias. In an effort to minimize the effect of outliers, the top and bottom 1% of dependent and independent variable outcomes are winsorized. Final firm-year observations are described in each table.

## 4. Empirical Results

### 4.1. Descriptive Statistics

Table 1 presents the summary statistics for the variables used in this paper. The mean (median) value of *SUSROA* is  $-0.044$  ( $-0.005$ ). *INTER* has a mean (median) of  $0.172$  ( $0.000$ ), with a standard deviation of  $0.278$ . The average *INTER\_BIO* measured by the interaction between *INTER* and the biotech dummy variable in the sample firm is  $0.007$ . Mean (median) values for *INTERRD*, the interaction between *INTER* and R&D intensity, are  $0.005$  ( $0.000$ ). *INTERRD\_BIO* indicates the interaction between *INTERRD* and the biotech dummy variable and the mean is  $0.001$ . The firms in our sample have an average size of  $25.398$  with a standard deviation of  $1.410$ . The mean value and standard deviation of *LEV* in our sample are  $0.915$  and  $1.062$ , respectively. The corporate growth rate based on equity (*MTB*) is  $1.901$  on average and another growth rate based on sales (*GROWTH*) is  $1.8\%$  on average. The *CFO* which indicates the liquidity shows the average value of  $0.032$ .

Table 1. Descriptive statistics.

Variables	Mean	STD	Min	Median	Max
<i>SUSROA</i>	$-0.044$	$0.588$	$-1.841$	$-0.005$	$3.331$
<i>INTER</i>	$0.172$	$0.278$	$0$	$0$	$0.973$
<i>INTER_BIO</i>	$0.007$	$0.063$	$0$	$0$	$0.973$
<i>INTERRD</i>	$0.005$	$0.038$	$0$	$0$	$1.835$
<i>INTERRD_BIO</i>	$0.001$	$0.031$	$0$	$0$	$1.835$
<i>SIZE</i>	$25.398$	$1.410$	$22.656$	$25.195$	$29.997$
<i>LEV</i>	$0.915$	$1.062$	$0.014$	$0.615$	$6.971$
<i>MTB</i>	$1.901$	$1.958$	$0.209$	$1.262$	$12.098$
<i>GROWTH</i>	$0.018$	$0.375$	$-1.523$	$0$	$1.418$
<i>CFO</i>	$0.032$	$0.104$	$-0.356$	$0.038$	$0.289$

Notes: Variable definition: *SUSROA* = sustainable earnings for year  $t$ , measured as the coefficient estimate ( $b_1$ ) from temporal regressions of  $ROA_{t+1} = b_0 + b_1 * ROA_t + e_t$  that are estimated for rolling five-year period for each firm; *INTER* = the ratio of foreign sales to total sales (in %); *INTER\_BIO* = the interaction between *INTER* and the biotech dummy variable; *INTERRD* = the interaction between *INTER* and R&D intensity; *INTERRD\_BIO* = the interaction between *INTERRD* and the biotech dummy variable; *SIZE* =  $\ln(\text{market value})$ ; *LEV* = total liability/total assets; *MTB* = market value of equity/book value of equity; *GROWTH* = sales growth, the changes in sales =  $(\text{sales}_t - \text{sales}_{t-1}) / \text{sales}_{t-1}$ ; *CFO* = operating cash flow divided by total assets.

Table 2 shows the Pearson correlation matrix for the main variables employed in this paper. The sustainable earnings measure, *SUSROA*, is negatively correlated with *INTER* and *INTER\_BIO* with significance at the 1% level. The correlation coefficients of both *INTERRD* and *INTERRD\_BIO*, two variables of interests, show significantly negative values of  $-0.028$  and  $-0.012$ , respectively. Overall, the univariate results of this study generally support the notion that international strategy and R&D intensity is related with sustainable earnings.



**Table 2.** A correlation matrix.

	(1)	(2)	(3)	(4)	(5)
<i>SUSROA</i> (1)	1.000	−0.015 (0.007)	−0.020 (0.001)	−0.028 (<0.0001)	−0.012 (0.028)
<i>INTER</i> (2)		1.000	0.157 (<0.0001)	0.226 (<0.0001)	0.057 (<0.0001)
<i>INTER_BIO</i> (3)			1.000	0.291 (<0.0001)	0.366 (<0.0001)
<i>INTERRD</i> (4)				1.000	0.826 (<0.0001)
<i>INTERRD_BIO</i> (5)					1.000

Note: see Table 1 for definitions of the variables.

#### 4.2. Main Results and Discussion

Table 3 grants the empirical results for Hypothesis 1 based on the estimation in Equation (1). Hypothesis 1 explores whether international strategy affects sustainable earnings by increasing corporate persistence in return on assets. Table 4 shows the coefficient estimates for testing Hypothesis 1 resulting from the OLS regressions, with the sustainable earnings (*SUSROA*) as the dependent variable. The F-statistic (55.79) of the regression model is statistically significant at 1% level, therefore, we conclude that our regression models are appropriate for analyses.

**Table 3.** The impact of internationalization strategy on sustainable earnings for firms with high research and development (R&D) intensity.

Variables	Coefficient	t-stat.
Intercept	−0.516	−7.50 ***
<i>INTER</i>	0.049	3.61 ***
<i>INTER_BIO</i>	−0.122	−2.07 **
<i>INTERRD</i>	−0.447	−2.72 ***
<i>INTERRD_BIO</i>	0.455	2.29 **
<i>SIZE</i>	0.026	9.97 ***
<i>LEV</i>	0.016	4.86 ***
<i>MTB</i>	−0.019	−10.24 ***
<i>GROWTH</i>	−0.039	−4.41 ***
<i>CFO</i>	−0.054	−1.57
Industry Dummy	Included	
Year Dummy	Included	
Adjusted R <sup>2</sup>	0.05	
F-stat.	52.64 ***	
N	29,583	

Notes: \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively. See Table 1 for definitions of the variables.

As predicted in Hypothesis 1, the findings report that the coefficient on *INTER* is positive (0.038) and statistically significant at the 0.01 level (t-stat. = 2.91). This significantly positive outcome supports Hypothesis 1, implying that corporate international strategy can be an effective tool for improving the sustainability of corporate earnings. On the contrary, the coefficient of *INTER\_BIO* is −0.109 and it is significant at the 5% level. This significant and negative coefficient suggests that the international strategy in biotech firms rather decreases the earnings sustainability. This empirical finding supports our first hypothesis. Moreover, all of the results among control variables are consistent with previous studies [43,45]. Control variables employed in the paper are the combined sets of earnings sustainability and *SIZE* is positively associated with persistence of earnings, suggesting that large firms are prone to

have high earnings sustainability. Not surprisingly, *LEV* is also significant, with a positive coefficient, indicating that firms with a higher degree of leverage are likely to have sustainable earnings. The rest of the control variables are also persistent with expectation. Negative correlations are found between the *SUSROA* and market-to-book (*MTB*), *GROWTH*, and *CFO* [46].

**Table 4.** The impact of international strategy on sustainable earnings.

Variables	Coefficient	t-Stat.
Intercept	−0.524	−7.63 ***
<i>INTER</i>	0.038	2.91 ***
<i>INTER_BIO</i>	−0.109	−1.98 **
<i>SIZE</i>	0.027	10.09 ***
<i>LEV</i>	0.016	5.05 ***
<i>MTB</i>	−0.020	−10.44 ***
<i>GROWTH</i>	−0.038	−4.26 ***
<i>CFO</i>	−0.051	−1.51
Industry Dummy	Included	
Year Dummy	Included	
Adjusted R <sup>2</sup>	0.05	
F-stat.	55.79 ***	
N	29,583	

Notes: \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively. See Table 1 for definitions of the variables.

When we discuss the results of Hypothesis 1, internationalization strategy helps in discovering the new market, spreading and selling, administrative cost, and exploiting the location-specific advantages which leads to an increase in profits and competitiveness in all firms [29]. However, companies usually abstain scarce resources to implement various corporate strategies, it is difficult to pursue all strategies simultaneously with limited resources, and trade-off exists between them [5]. The results for Hypothesis 1 confirm that manufacturing firms can have a positive impact on corporate performance if it is internationalized but this is not the case for biotech companies. This is because internationalization strategy is exposed to the cultural and institutional environment of various countries, and because of the liability of foreignness, there may be an incremental cost to adjusting in the foreign market [11]. Even though this reasoning applies to non-biotech firms, the cost of dealing with internationalization for biotech firms will be higher than that of non-biotech firms. The key strategy for biotech firms' innovation is the R&D investment, and these firms' core value chain activities will be focused on R&D strategies [35]. Consequently, high levels of complexity from pursuing an internationalization strategy in biotech firms rather worsen corporate sustainable earnings [5]. These results are slightly different from the research in Qian and Li [3] that examined the effect of innovator position, market awareness, niche operation, and internationalization on the performance of small and medium-sized firms in biotechnology industries. Although they reported a positive relation between internationalization and profitability of small and medium-sized firms in biotechnology industries, their research is subject to limitation by using small and medium-sized firms only and they did not reflect the sustainable aspects of performance measure.

Thus far, prior studies have focused on simple measures of operating performance to evaluate firm performance and establish a negative correlation between R&D intensity and firm performance [47–49]. This study, however, concentrates on earnings sustainability measures to test whether R&D intensity moderates the relationship between international strategy and sustainable earnings. The coefficient of *INTERRD* is negative and statistically significant, indicating that non-biotech firms with higher R&D intensity are not likely to have persistent earnings. This finding provides support to Hypothesis 2, predicting that R&D intensity has a moderating effect on sustainable earnings. Furthermore, the coefficient of *INTERRD\_BIO* is positive and statistically significant, suggesting that biotech firms with

higher R&D intensity rather increase persistently in earnings. These results also support Hypothesis 2 and the notion that the degree of R&D intensity acts as a moderating effect in strengthening existing effects of variables.

When we discuss the empirical findings in Hypothesis 2, internationalization strategy and R&D activities are considered to be the two main activities carried out for the firm's innovation [3,5,11,13]. The result of Hypothesis 2 implies that different industries may have different primary strategies. In other words, general manufacturing has shown both that international strategies can help create sustainable profitability and that biotech companies must focus on their main activities, R&D, while also executing other strategies in order to generate sustainable earnings. In a practical perspective, biotech firms in South Korea have a relatively small domestic market to operate. To expand the business capacity and to pursue long-term sustainable growth, firms need to pursue overseas business opportunities through internationalization. In particular, there is a possibility that the biotech firms cannot guarantee sufficient profits required to cover the high R&D expenditure if they operated only in a single market such as South Korea [3]. Since the long-term growth model of domestic biotech firms is moving beyond the domestic market to create demand through international market exploration, it is necessary to develop innovative new products with the consistent investment in R&D activity and at the same time generate profits by pioneering global markets by implementing internationalization strategy. All of these empirical results are consistent with the findings in Lee and Lee [35] in that proper implementation of differentiation strategy is positively associated with the sustainability of accounting outcomes. To be more precise, for biotech firms that maintain R&D investment as the key differentiation strategy, the impact of internationalization strategy on future sustainability of earnings is influenced by R&D intensity.

Overall, empirical evidence in Tables 3 and 4 support Hypothesis 1 and Hypothesis 2. Specifically, this study provides the important fact that implementing internationalization strategy while maintaining a high level of R&D intensity can improve the overall sustainability in earnings for biotech firms.

#### 4.3. Robustness Regression

To begin with, we conducted the test for autocorrelation. This procedure is generally conducted when the errors in time series data are autocorrelated. When time series data are used in regression analysis, often the error term is not independent through time. Instead, the errors maybe serially correlated (autocorrelated). If the error term is autocorrelated, the efficiency of ordinary least squares (OLS) parameter estimates can be adversely affected and standard error estimates are biased. First, to diagnose autocorrelation, we produced generalized Durbin–Watson (DW) statistics and their marginal probabilities. As a result, we received the following results ( $DW=1.1281$ ,  $Pr < DW = 0.6545$ ,  $Pr > DW = 0.3455$ ) that there is little possibility of autocorrelation.

Moreover, we conducted additional clustering techniques to control for the possible endogeneity problem. By clustering analyses and analyzing the firm and year together, we control for both potentially uneven distribution of residuals and any correlation within the group of residuals [50]. This produces more conservative t-statistics by computing standard deviations which reflect the samples' cross-sectional correlations and time series [50]. Using these empirical results, we are able to more accurately predict individual outcomes with confidence.

Table 5 shows the results of the firm-year fixed regression. Overall, the findings are consistent with the main results suggesting that the relationship between international strategy, R&D intensity, and sustainable earnings is still significant after controlling for the robustness.

Table 5. Cluster analyses.

Panel A. H1		
Variables	Coefficient	t-Stat.
Intercept	−0.524	−7.63 ***
<i>INTER</i>	0.038	2.91 ***
<i>INTER_BIO</i>	−0.109	−1.98 **
Controls	Included	
Industry Dummy	Included	
Year Dummy	Included	
Adjusted $R^2$	0.05	
F-stat.	55.79 ***	
N	29,583	
Panel B. H2		
Variables	Coefficient	t-Stat.
Intercept	−0.516	−7.50 ***
<i>INTER</i>	0.049	3.61 ***
<i>INTER_BIO</i>	−0.122	−2.07 **
<i>INTERRD</i>	−0.447	−2.72 ***
<i>INTERRD_BIO</i>	0.455	2.29 **
Controls	Included	
Industry Dummy	Included	
Year Dummy	Included	
Adjusted $R^2$	0.05	
F-stat.	52.63 ***	
N	29,583	

Notes: \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively. See Table 1 for definitions of the variables.

#### 4.4. Alternative Proxies of Sustainable Earnings

As in previous studies of earnings sustainability, we use modified discretionary accruals as an alternative proxy of sustainable earnings [51,52]. Discretionary accruals are the residuals from the cross-sectional modified Jones model below. In the model,  $i$  represents the firm and  $t$  represents the fiscal year.  $TA$  stands for the total accruals, which are calculated by subtracting operational cash flow from net income. Each variable is scaled based on the lagged total assets.  $\Delta S$  is the change in sales, and  $\Delta AR$  is the change in accounts receivables.  $PPE$  is property, plant, and equipment.  $ROA$ , which represents return on assets, is included in this model because discretionary accruals are affected by firm performance [53]. Equation (4) is calculated for each industry-year. The absolute value of residuals is considered discretionary accruals ( $DA$ ), which expresses accrual management that both increases and decreases income [52]. Equation (4) contains the estimation model as follows:

$$\frac{TA_t}{A_{t-1}} = \alpha_0 + \beta_1 \frac{1}{A_{t-1}} + \beta_2 \frac{\Delta S_t - \Delta AR_t}{A_{t-1}} + \beta_3 \frac{PPE_t}{A_{t-1}} + \beta_4 ROA_t + \varepsilon_t \quad (4)$$

where  $TA_t$  = net income-cash flow from operations;  $S_t$  = sales revenue;  $AR_t$  = accounts receivables;  $PPE_t$  = plant, property, and equipment;  $ROA_t$  = net income/total assets;  $A_{t-1}$  = total assets.

Table 6 shows the additional regression results of testing the effectiveness of international strategy and R&D intensity on sustainable earnings using discretionary accruals ( $DA$ ) as the alternative dependent variables. As shown in Panel A, the coefficient of  $INTER\_BIO$  is significantly negative, indicating that international strategy adversely affects sustainable earnings especially for biotech firms. Moreover, the results in Panel B of Table 6 report that R&D intensity moderates the effects of international strategy in each firm resulting in a negative coefficient for  $INTERRD$  and a positive

coefficient for *INTERRD\_BIO*. Overall, the results in Table 6 are consistent with the main findings of Hypothesis 1 and Hypothesis 2, namely that the effects of international strategy and R&D intensity affect sustainable earnings regardless of various earnings sustainability measures.

**Table 6.** Alternative proxies of sustainable earnings.

Panel A. H1		
Variables	Coefficient	t-Stat.
Intercept	0.255	8.45 ***
<i>INTER</i>	0.007	2.06 **
<i>INTER_BIO</i>	−0.024	−1.71 *
Controls	Included	
Industry Dummy	Included	
Year Dummy	Included	
Adjusted $R^2$	0.06	
F-stat.	47.56 ***	
N	29,583	
Panel B. H2		
Variables	Coefficient	t-Stat.
Intercept	−0.386	−17.36 ***
<i>INTER</i>	0.006	2.52 **
<i>INTER_BIO</i>	0.005	0.51
<i>INTERRD</i>	−0.109	−2.69 ***
<i>INTERRD_BIO</i>	0.226	4.82 ***
Controls	Included	
Industry Dummy	Included	
Year Dummy	Included	
Adjusted $R^2$	0.11	
F-stat.	85.15 ***	
N	29,583	

Notes: \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively. See Table 1 for definitions of the variables.

#### 4.5. Consideration of R&D Stage

This study seeks to add to the existing literature on the treatment of R&D accounting by concentrating on significant qualitative differences between groups, specifically young-stage and mature-stage firms. In a previous study, Oswald [54] shows that while large firms usually expense R&D expenditures, steady-state firms, or firms where R&D capitalization equals amortization, tend to expense R&D outlays instead. As in that study, we define mature-stage firms as those in which the difference between the amount of capitalized R&D and the amount of amortized is greater than the median, while young-stage firms as those in which the opposite is true.

In Panel A of Table 7, the coefficient *INTER* has a strong positive correlation to sustainable earnings in the mature stage, whereas *INTER\_BIO* has a strong negative association with earnings sustainability, implying a significant influence of international strategy for non-biotech mature firms. Additionally, the coefficients for *INTERRD* and *INTERRD\_BIO* in Panel B show the opposite signs compared to H1, indicating that the moderating effect R&D intensity has on the relation between international strategy and sustainable earnings is only present in the mature stage.



Table 7. R&amp;D stage.

Panel A. H1				
Variables	Mature Stage		Young Stage	
	Coeff.	t-Stat.	Coeff.	t-Stat.
Intercept	−0.501	−2.71 ***	−0.844	−5.20 ***
<i>INTER</i>	0.073	3.09 ***	0.006	0.43
<i>INTER_BIO</i>	−0.226	−2.98 ***	0.067	0.79
Controls	Included		Included	
IND Dummy	Included		Included	
YEAR Dummy	Included		Included	
$R^2$	0.06		0.04	
F-stat.	16.99 ***		24.38 ***	
N	6871		17,125	
Panel B. H2				
Variables	Mature Stage		Young Stage	
	Coeff.	t-Stat.	Coeff.	t-Stat.
Intercept	−0.795	−4.95 ***	−0.498	−2.68 ***
<i>INTER</i>	0.181	1.93 *	0.076	2.87 ***
<i>INTER_BIO</i>	0.016	1.05	−0.229	−2.79 ***
<i>INTERRD</i>	−0.689	−2.72 ***	−0.065	−0.19
<i>INTERRD_BIO</i>	0.587	2.12 **	0.056	0.12
Controls	Included		Included	
IND Dummy	Included		Included	
YEAR Dummy	Included		Included	
$R^2$	0.04		0.07	
F-stat.	22.85 ***		15.96 ***	
N	6871		17,125	

Notes: \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively. See Table 1 for definitions of the variables.

## 5. Conclusions

Due to the changing landscape of the global biotech industry, emerging biotech markets struggle with sustainability. The environment is defined by rapid changes to technologies, customers, and competition, which forces firms to prioritize constant investment in R&D in order to innovate and achieve a competitive advantage [55]. This means that biotech firms generally dedicate substantial amounts of money to R&D activities in the hopes of increasing future profitability. However, the lengthy timeline of R&D coupled with the limitations of a domestic market make it almost impossible to generate the sales needed to recover that investment in R&D if the firm only operates in a single market like Korea. Therefore, the long-term growth model of a domestic biotech firm must be expanded by exploring and creating demand within the international market. Still, relatively little research has been done on the internationalization of biotech firms.

We have attempted to respond to that deficiency by analyzing the relationship between the international strategy and sustainable earnings of biotech firms in this study. By using persistent earnings as a measure of the sustainability of earnings, we find that the implementation of an international strategy generally decreases sustainable earnings. Our results further suggest that when a high degree of internationalization is combined with high R&D intensity, sustainable earnings generally increase. Even after controlling for different testing methods and alternative measures, these results are robust. However, other findings suggest that firms should take caution when considering pairing an internationalization strategy with high R&D intensity. We find that the effectiveness of this combination is only apparent in

the mature stage of stable and consistent R&D activities, an important distinction for standard-setters, investors, and regulators to consider.

In total, this study contributes to the relevant collection of literature in a number of ways. First of all, to our knowledge, there is no previous literature that evaluates the effect of internationalization strategy with high R&D intensity on earnings sustainability in South Korea. We extend the research on the determinants of sustainable earnings by empirically proving that biotech firms' internationalization strategy with high R&D investments leads to an increase in earnings sustainability. Second, in regards to profitability, this study expands upon prior findings by adopting new measures of sustainable earnings. The persistence of earnings measure differs in their units of measurement. Unlike the existing profitability measures in literature which are measured at one specific time, a flow variable of sustainable earnings is measured over an interval of time. Hence, the persistence of earnings is more sustainable than comparable measures due to the fact that it has little room for the intentional manipulation of financial statements. Third, the results of this study are likely to be of interest to biotech investors, especially foreign investors evaluating South Korean biotech firms. In this case, investors may want to focus on corporate strategies, since the implementation of an international strategy by a biotech firm with high R&D intensity improves sustainability. Future research can build on these findings by focusing on other proxies of sustainable information and by analyzing data from other emerging markets where internationalization strategies have been implemented. Finally, although some prior studies examine the relation between internationalization strategy, R&D intensity, and firm value, by focusing on the developed nations such as the European Union (EU) and United States (US), there is little evidence reporting from emerging markets such as South Korea because of discrepancies in the growth rate of biotech industry. This study can fill this gap by recording the diverse forms of corporate strategies in biotech firms.

This study has the following caveats: First, the focus on biotech firms can provide a powerful setting to examine the research topics, but it can be hard to generalize the empirical results to other industries with different business environments. Additionally, due to the relatively low number of biotech companies, the small sample size may affect the explanatory power of the empirical model and validity of this study in sophistication. Second, this paper employed the persistence of earnings measure to maximize the sustainability concept in measuring a corporate performance. However, it is important to precisely estimate the corporate performance in recent dynamic capital markets. According to theory on physical capital maintenance, the performance measure of physical capital to maintain is superior to the concept of financial capital maintenance to precisely assess the firm's real performance. Although it seems that performance by physical capital maintenance can reflect the real profit of a firm, measuring physical capital is more difficult than evaluating financial capital in practice. Therefore, we admit it as a limitation of this research. Still, this paper contributes to the prior studies through a presentation of how the moderating effect of R&D investment impacts the association between internationalization strategy and the persistence of earnings by comparing biotech with non-biotech firms.

**Author Contributions:** Conceptualization, Y.Y.; methodology, J.L.; software, J.L.; validation, Y.Y. and J.L.; formal analysis, J.L.; investigation, J.L.; resources, J.L.; data curation, J.L.; writing—original draft preparation, Y.Y.; writing—review and editing, Y.Y.; supervision, Y.Y. and J.L.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Available online: <https://pulsenews.co.kr/view.php?year=2019&no=45813> (accessed on 22 August 2019).
2. Available online: <https://en.yna.co.kr/view/AEN20190422001900320> (accessed on 22 August 2019).
3. Qian, G.; Li, L. Profitability of small- and medium-sized enterprises in high-tech industries: The case of the biotechnology industry. *Strat. Manag. J.* **2003**, *24*, 881–887. [CrossRef]
4. D'Aveni, R.A.; Dagnino, G.B.; Smith, K.G. The age of temporary advantage. *Strateg. Manag. J.* **2010**, *31*, 1371–1385. [CrossRef]

5. Vithessonthi, C.; Racela, O.C. Journal Multinational Financial Short- and long-run effects of internationalization and R & D intensity on firm performance. *J. Multinatl. Financ. Manag.* **2016**, *34*, 28–45. [[CrossRef](#)]
6. Ehie, I.C.; Olibe, K. The effect of R&D investment on firm value: An examination of US manufacturing and service industries. *Int. J. Prod. Econ.* **2010**, *128*, 127–135. [[CrossRef](#)]
7. Brännback, M.; Carsrud, A.; Renko, M. Exploring the born global concept in the biotechnology context. *J. Enterp. Cult.* **2007**, *15*, 79–100. [[CrossRef](#)]
8. Baysinger, B.D.; Kosnik, R.D.; Turk, T.A. Effects of Board and Ownership Structure on Corporate R&D Strategy. *Acad. Manag. J.* **1991**, *34*, 205–214. [[CrossRef](#)]
9. Kang, K.N.; Park, H. Influence of government R&D support and inter-firm collaborations on innovation in Korean biotechnology SMEs. *Technovation* **2012**, *32*, 68–78. [[CrossRef](#)]
10. Lindstrand, A.; Melén, S.; Nordman, E.R. Turning social capital into business: A study of the internationalization of biotech SMEs. *Int. Bus. Rev.* **2011**, *20*, 194–212. [[CrossRef](#)]
11. Tsao, S.M.; Chen, G.Z. The impact of internationalization on performance and innovation: The moderating effects of ownership concentration. *Asia Pac. J. Manag.* **2012**, *29*, 617–642. [[CrossRef](#)]
12. Miller, S.R.; Lavie, D.; Delios, A. International intensity, diversity, and distance: Unpacking the internationalization- performance relationship. *Int. Bus. Rev.* **2016**, *25*, 907–920. [[CrossRef](#)]
13. Capar, N.; Kotabe, M. The relationship between international diversification and performance in service firms. *J. Int. Bus. Stud.* **2003**, *34*, 345–355. [[CrossRef](#)]
14. Denis, D.J.; Denis, D.K.; Yost, K. American Finance Association Global Diversification, Industrial Diversification, and Firm Value. *Sour. J. Financ.* **2002**, *57*, 1951–1979. [[CrossRef](#)]
15. Glaum, M.; Oesterle, M.-J. 40 years of research on internationalization and firm performance: More questions than answers? *Manag. Int. Rev.* **2007**, *47*, 307–317. [[CrossRef](#)]
16. Hitt, M.A.; Hoskisson, R.E.; Kim, H. International diversification: Effects on innovation and firm performance in product-diversified firms. *Acad. Manag. J.* **1997**, *40*, 767–798.
17. Lu, J.W.; Beamish, P.W. The internationalization and performance of SMEs. *Strat. Manag. J.* **2001**, *22*, 565–586. [[CrossRef](#)]
18. Lu, J.W.; Beamish, P.W. International diversification and firm performance: The s-curve hypothesis. *Acad. Manag. J.* **2004**, *47*, 598–609.
19. Nam, H.-J.; An, Y. Patent, R&D and internationalization for Korean healthcare industry. *Technol. Forecast. Soc. Chang.* **2017**, *117*, 131–137.
20. Gassmann, O.; Keupp, M.M. The competitive advantage of early and rapidly internationalizing SMEs in the biotechnology industry: A knowledge-based view. *J. World Bus.* **2007**, *42*, 350–366. [[CrossRef](#)]
21. Lee, N. R&D Accounting Treatment, R&D State and Tax Avoidance: With a Focus on Biotech Firms. *Sustainability* **2018**, *11*, 44.
22. Bae, S.C.; Noh, S. Multinational corporations versus domestic corporations: A comparative study of R&D investment activities. *J. Multinatl. Financial Manag.* **2001**, *11*, 89–104.
23. Bialek-Jaworska, A.; Gabryelczyk, R. Biotech spin-off business models for the internationalization strategy. *Balt. J. Manag.* **2016**, *11*, 380–404. [[CrossRef](#)]
24. Cozza, C.; Franco, C.; Perani, G. R&D endowments at home driving R&D internationalization: Evidence from the Italian Business R&D survey. *Technol. Forecast. Soc. Chang.* **2018**, *134*, 277–289.
25. Kale, D. From small molecule generics to biosimilars: Technological upgrading and patterns of distinctive learning processes in the Indian pharmaceutical industry. *Technol. Forecast. Soc. Chang.* **2019**, *145*, 370–383. [[CrossRef](#)]
26. Veilleux, S.; Roy, M.J. Strategic use of corporate and scientific boards in the internationalization of biotech firms. *Int. J. Technoentrep.* **2015**, *3*, 67. [[CrossRef](#)]
27. Rahko, J. Internationalization of corporate R&D activities and innovation performance. *Ind. Corp. Chang.* **2015**, *25*, 1019–1038.
28. Geringer, M.; Beamish, P.; Da Costa, R. Internationalization: Implications for MNE performance. *Strateg. Manag. J.* **1989**, *10*, 109–119. [[CrossRef](#)]
29. Suh, Y.; Kim, M.-S. Internationally leading SMEs vs. internationalized SMEs: Evidence of success factors from South Korea. *Int. Bus. Rev.* **2014**, *23*, 115–129. [[CrossRef](#)]
30. Kobrin, S.J. An empirical analysis of the determinants of global integration. *Strateg. Manag. J.* **1991**, *12*, 17–31. [[CrossRef](#)]

31. Kotabe, M.; Srinivasan, S.S.; Aulakh, P.S. Multinationality and firm performance: The moderating role of R&D and marketing capabilities. *J. Int. Bus. Stud.* **2002**, *33*, 79–97.
32. Helpman, E.; Melitz, M.J.; Yeaple, S.R. Export versus FDI with heterogeneous firms. *Am.Econ.Rev.* **2004**, *94*, 300–316. [\[CrossRef\]](#)
33. Wagner, H. Internationalization speed and cost efficiency: Evidence from Germany. *Int. Bus. Rev.* **2004**, *13*, 447–463. [\[CrossRef\]](#)
34. Kim, W.C.; Hwang, P.; Burgers, W.P. Multinationals' diversification and the risk-return trade-off. *Strat. Manag. J.* **1993**, *14*, 275–286. [\[CrossRef\]](#)
35. Lee, N.; Lee, J. Differentiation Strategy, R&D Intensity, and Sustainability of Accounting Earnings: With a Focus on Biotech Firms. *Sustainability* **2019**, *11*, 1902.
36. Zahra, S.A.; Ireland, R.D.; Hitt, M.A. International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Acad. Manag. J.* **2000**, *43*, 925–950.
37. Morck, R.; Yeung, B. Why Investors Value Multinationality. *J. Bus.* **1991**, *64*, 165. [\[CrossRef\]](#)
38. Bodnar, G.M.; Weintrop, J. The valuation of the foreign income of US multinational firms: A growth opportunities perspective. *J. Account. Econ.* **1997**, *24*, 69–97. [\[CrossRef\]](#)
39. Available online: <http://www.businesskorea.co.kr/news/articleView.html?idxno=33459> (accessed on 22 August 2019).
40. Sloan, R. Do stock prices fully reflect information in accruals and cash flows about future earnings? *Account. Rev.* **1996**, *71*, 289–315.
41. Francis, J.; Lafond, R.; Olsson, P.M.; Schipper, K. Costs of Equity and Earnings Attributes. *Account. Rev.* **2004**, *79*, 967–1010. [\[CrossRef\]](#)
42. Hsu, W.-T.; Chen, H.-L.; Cheng, C.-Y. Internationalization and firm performance of SMEs: The moderating effects of CEO attributes. *J. World Bus.* **2013**, *48*, 1–12. [\[CrossRef\]](#)
43. Koufteros, X.; Lu, G.; Peters, R.C.; Lai, K.-H.; Wong, C.W.; Cheng, T.E. Product development practices, manufacturing practices, and performance: A mediational perspective. *Int. J. Prod. Econ.* **2014**, *156*, 83–97. [\[CrossRef\]](#)
44. Dudley, E. Capital structure and large investment projects. *J. Corp. Financ.* **2012**, *18*, 1168–1192. [\[CrossRef\]](#)
45. Ahluwalia, S.; Ferrell, O.C.; Ferrell, L.; Rittenburg, T.L. Sarbanes–Oxley Section 406 Code of Ethics for Senior Financial Officers and Firm Behavior. *J. Bus. Ethic.* **2016**, *151*, 693–705. [\[CrossRef\]](#)
46. Barth, M.E.; Landsman, W.R.; Lang, M.H. International Accounting Standards and Accounting Quality. *J. Account. Res.* **2008**, *46*, 467–498. [\[CrossRef\]](#)
47. Cui, H.; Mak, Y. The relationship between managerial ownership and firm performance in high R&D firms. *J. Corp. Financ.* **2002**, *8*, 313–336.
48. Hsu, C.-C.; Boggs, D.J.; Hsu, C. Internationalization and Performance: Traditional Measures and Their Decomposition. *Multinat. Bus. Rev.* **2003**, *11*, 23–50. [\[CrossRef\]](#)
49. Majocchi, A.; Zucchella, A. Internationalization and performance: Findings from a set of Italian SMEs. *Int. Small Bus. J.* **2003**, *21*, 249–268. [\[CrossRef\]](#)
50. Petersen, M.A. Estimating standard errors in finance panel data sets: Comparing approaches. *Rev. Financ. Stud.* **2009**, *22*, 435–480. [\[CrossRef\]](#)
51. Kothari, S.; Leone, A.J.; Wasley, C.E. Performance matched discretionary accrual measures. *J. Account. Econ.* **2005**, *39*, 163–197. [\[CrossRef\]](#)
52. Lee, W.J. Toward Sustainable Accounting Information: Evidence from IFRS Adoption in Korea. *Sustainability* **2019**, *11*, 1154. [\[CrossRef\]](#)
53. Dechow, P.; Sloan, R.; Sweeney, A. Causes and consequences of earnings manipulation: An analysis of firm's subject to enforcement actions by the SEC. *Contemp. Account. Res.* **1996**, *13*, 1–36. [\[CrossRef\]](#)
54. Oswald, D.R. The Determinants and Value Relevance of the Choice of Accounting for Research and Development Expenditures in the United Kingdom. *J. Bus. Financ. Account.* **2008**, *35*, 1–24. [\[CrossRef\]](#)
55. Xu, J.; Sim, J.-W. Characteristics of Corporate R&D Investment in Emerging Markets: Evidence from Manufacturing Industry in China and South Korea. *Sustainability* **2018**, *10*, 3002.

