sustainability

MDPI

Article

Does Partner Volatility Have Firm Value Relevance? An Empirical Analysis of Part Suppliers

Insung Son [1] and Sihyun Kim [2,*]

[1] Department of Management, Gyeongsang National University, Jinjudae-ro 501, JinJu 52828, Korea; insung_son@gnu.ac.kr
[2] Department of Logistics, Korea Maritime and Ocean University, Busan 49112, Korea
* Correspondence: sihyunkim@kmou.ac.kr; Tel.: +82-(0)-51-410-4331

Received: 13 February 2018; Accepted: 6 March 2018; Published: 7 March 2018

Abstract: Considering the lifecycle of products, firms are releasing new products through diversified strategic partnerships via the global supply chain. As the uncertainty about the future increases and strategic partnership grows more important, part suppliers are becoming more and more significant in assessing firm value. From the perspective of the signaling effect, this study analyzed the impact of partner volatility (new partner, old partner, revocation partner) on firm value in terms of global supply chain management. Regarding both Apple and Samsung which have bisected the premium smart phone market, research results reveal that companies eliminated from partnership selection are found to show negative signaling effect, and the newly selected companies have the stronger innovative capacity and higher signaling effect of higher excess earning rate than that of re-selected companies. The findings indicate that the partner volatility of partner companies work as a reliable investment signal for investors to recognize as an investment indication, contributing to firm value. In particular, it is meaningful to confirm that a new partner's differentiated R&D capacity is a key factor of new product launching and a significant variable capable of determining a firm's survival in the smart phone market.

Keywords: supply chain management; partner volatility; the signaling effect; firm value

1. Introduction

The concept of sustainability incorporates economic, social, and environmental perspectives, and sustainability strategies and practices can be different in different business environments. Kang and Kim [1] argued that, with rapidly changing technical advances, firms need to release a new product to be sustainable in highly intensified competition. Investment in company new product development (NPD) affects firm value increase or decrease. For instance, when the NPD expense is larger than its sales increase effect through new product launch (NPL), company profit falls and short-term firm value could drop. However, in consideration of the purpose of company strategy to maximize firm value, continued new product preannouncement (NPP) helps accumulate brand asset and customer asset, which leads to long-term profit and improves a firm's values.

Study on the effect of NPP on firm value is advanced in terms of direct effect where NPP increases financial performance to expand firm value and signal effect where investors are affected to increase firm value. The effect of NPP signal effect on firm value can be identified based on change in investors' awareness on future cash flow [2]. Factors influencing NPP signal effect continuously include reliable information [3,4], particularity in NPP contents [5], strong innovative capacity [6] and reasonable slack resources [7].

Regarding NPP effect, prior studies focused on the company level that launched new product. Such an approach is limited as it examines only companies dealing with finished goods or their

equivalents while overlooking more specific part suppliers. With increased globalization and offshore sourcing, the global supply chain is becoming an important issue for many businesses. The global supply chain involves a company's worldwide interests and suppliers rather than simply a local or national orientation. In fact, a company cannot launch a new product solely for itself in the global market. They are releasing new products through diversified strategic partnerships via the global supply chain. Therefore, it is necessary to consider up to more realistic levels by understanding the relationship between NPP investment participating part suppliers and company performance. In this sense, the study, under the assumption that the firm value of part suppliers providing new technology or entering new NPP would increase, seeks to focus on the effect of such companies' innovative capacity and slack resources on firm value.

As the uncertainty about the future increases and strategic partnership grows more important, part suppliers are becoming more and more significant in assessing firm value. However, there has been not study researching any relation of new NPP participating company or re-selected company and revocation partner on firm value. Against this backdrop, this study focuses on that partner volatility (new partner, old partner, revocation partner) can be recognized by investors as signal effect to work as an investment indication. Therefore, considering participating partners' volatility would be essential in looking at the relationship with the firm value of NPP partnership joining part suppliers.

We plan to take the partner volatility in NPP as a key variable and empirically examine the effect of NPP on firm value. It is practically meaningful that, in understanding the relationship between NPP and firm value, by considering the volatility of partners joining the partnership, more realistic and relevant comprehensive understanding can be promoted. Moreover, partner volatility proposed in this study has an academic significance in that discussion on partner volatility has been insufficient even that NPP activity investment has been volatile rather than constant at all time. In this study, it was viewed that, based on the case of the global smart phone market, the key factors of core competence and slack resources would determine firm value depending upon partner volatility explaining firm value in rapidly changing technical advances and the focus was placed on the relation between partner volatility and signal effect in highly competitive business environment. In other words, in explaining firm value, partner volatility was regarded as a variable influencing investors' decision making and, firstly, the research hypotheses analyzing the signal effect between partner volatility and firm value are to be tested in this paper.

2. Literature Review and Hypothesis Development

2.1. Signal Effect of NPP

In capital market, company stakeholders have different levels of information. There exists information asymmetry where investors who are in an inferior status to access detailed company management information have different level of information than that held by managers who are in a superior status. This information asymmetry causes adverse selection and signaling effect.

The adverse selection theory and signaling theory both assume information asymmetry situation, but they are different because the former argues the one holding more information hides it, but the latter argues such a person opens it more actively. Adverse selection means that when investors are not well aware of the information a manager well understands, they may choose an adverse object. Examples can be found in company NPP as well. On the contrary that this adverse selection is caused by information concealment, signaling effect comes from voluntary information opening at own expanse. It has been utilized in NPP strategy as a signaling means of company with superior information to inform investors who lack information [2]. Therefore, information on company new product development has a strong signal effect on investors. That is, when a company pursues new product development, new technology and partner changes are used as a signal to investors. From the perspective of adverse selection, information asymmetry causes overinvestment or under

investment. Therefore, companies utilize NPP strategy as a means to resolve the problem by signaling detailed information on the actual status of new product to investors.

Preceding study on NPP has been performed in three directions—study on NPP time point [2], study on NPP contents [8,9] and study on NPP effectiveness [5,10]. Regarding the studies on NPP effectiveness of them, Sorescu et al. [5] regarded NPP as a strategic signal sent to diverse stakeholders such as investors, shareholders and suppliers and found that only the companies providing specific information on product had high short-term excess profit rate in their empirical study. They also argued that if new information is continuously provided on NPP progress, reliability improves, and long-term excess return moves up. Warren and Sorescu [11] studied 4845 samples of 826 US companies and found that repeated events such as NPP strategy had reflected positive expectations of investors on company future performance.

Study on marketing-finance interface is already an important study subject in the marketing sector. Specifically, advertising expenditure [12], distribution channel expansion [13], etc. are the studies increasing company future cash flow and firm value. Marketing strategies such as NPP have been actively researched using event study approach in estimating firm value [5,14,15]. For instance, Sorescu et al. [5] argued that, in the public announcement effect of NPP, that investors show positive response to the particularity of NPP content and its reliability. Regarding the announcement effect in each phase of innovative new product development, public pre-announcement and launching. Sood and Tellis [14] empirically demonstrated that public announcement had the highest profitability among them while the launching had the lowest. With respect to the public announcement effect dividing innovative new product into make (direct making), buy (buying from outside) and ally (allying), Borah and Tellis [15] found that investors had positive response to make and ally whereas negative response to buy.

NPP functions as a direct signal providing information to investors while helping increase sales and profit for elevated firm value. NPP signal effect refers to that, under information asymmetry, the information provided by managers with a superior access to information on new product to investors with an inferior access is recognized as a sign of financial performance change and it is reflected in stock price. NPP signal effect, as firm value, is identified based on investors' awareness change on company future cash flow [2,16]. Factors with continued positive influence over NPP signal effect include reliable information [3,4], particularity of NPP contents [5] strong innovative capacity [6] and reasonable slack resources [7,17].

When there exists information asymmetry between companies announcing new product publicly and part suppliers' investors in the smart phone industry, the problem of adverse selection could arise. Managers are aware of information on innovative new product but outside investors are not. Therefore, investors assume that managers pursue NPP only when they have good innovative information. Therefore, investors would invest in new entrants or companies providing new technology and this, in turn, would make companies do NPP only when they actually think their new product has high innovativeness. Consequentially, the larger the signal effect of the information on new partner and new technology provided to NPP, the higher the excess return of investors on the corresponding information [5]. With this understanding, the study establishes hypotheses as follows based on the studies above;

Hypothesis 1. A new partner at the NPP have a higher excess return than an old partner.

Hypothesis 2. A revocation partner at the NPP show a negative stock excess return.

2.2. Innovative Capacity and Firm Value

In resource-based theory, innovative capacity is defined as the capacity to integrate internal/external company resources such as information, knowledge and technology and create new resource [18]. Innovative capacity is the ability of a company to publicly announce new products on the continued basis. It is divided into incremental innovative capacity and radical innovative

capacity [19]. The incremental innovative capacity is the ability to generate the kind of innovation improving and reinforcing the existing products and services. It is derived from reinforced knowledge. The radical innovative capacity is the ability to create large-scale transformation in the existing products and services and derived from transformed knowledge [20].

Companies use their internal tangible and intangible resources to respond to external environmental changes, catch opportunities and build strategic partnerships to help improve their innovative capacity for new product development. From this perspective, innovative capacity plays an important role in supporting companies' sustainable new product announcements. New technologies applied to new product are made because of innovative activities [21]. Such company research and development (R&D) activities are essential factors improving the innovative capacity. In general, the higher the R&D intensity, the higher innovative capacity the company is likely to achieve. George et al. [22] stressed that R&D investment is a key factor with positive effect on new product development and particularly if well connected to corporate strategy, could achieve even higher achievement. Bhattacharya and Bolch [23] argued that innovative capacity facilitates continued change in new product and service and showed R&D investment was a factor influencing innovative capacity.

In study on the effect of innovative capacity on firm value, capitalized research and development costs is explained to have a positive effect on firm value and expensed R&D costs, a negative effect. It can be also explained that investors recognize the former as a future economic profit while the latter as no expected future value. This means that the higher the share of intangible expenditure, the more serious the information asymmetry between company and investors. As such, I company R&D activity affects its future management performance on the continued basis, company R&D expenditure will be important information to investors. Since R&D investment elevating company innovative capacity causes information asymmetry between managers and investors, investors lacking company R&D investment information demand additional premium thus, increasing companies' external financing expense [24]. In general, tangible assets reflect value changed through asset inflow and outflow awareness but it is not easy for intangible assets. Given this characteristic, information on the intangible asset, R&D expenditure, can be an attractive source of information as it is asymmetric.

Companies are worried about potential information leakage to their rival firms in new product development process, so they prefer internal fund over external fund. For this reason, new product development based on the internal fund of retained income is an important factor determining a company's innovative capacity [25]. A study investigated the hypothesis that the higher the innovative capacity, the more R&D expenditure the company uses and the market responds to it as an excess return. The study assumed that the information on R&D cost was not sufficiently reflected in stock price yet. On the other hand, Lev and Sougiannis [26] argued that R&D expenditure is not a short-term cost to develop a new technology or copy a rival's technology, but its benefit is capitalized into a future intangible asset. As such, R&D expenditure affects company productivity and can contribute to sales and profit expansion thus, working as a positive sign to market investors.

For companies with a strong innovative capacity, investors interpret R&D expenditure as risk premium according to cost increase and demand a higher excess return. Since capitalized R&D expenditure increase brings about company economic benefits, it functions as a good sign to attract investors expectedly to push up stock price. With this understanding, the following hypotheses can be established based on the studies above;

Hypothesis 3. *A new partner at the NPP have a strong innovative capacity to have a positive effect on excess return.*

Hypothesis 4. *A revocation partner at the NPP have a weak innovative capacity to have a negative effect on excess return.*

2.3. Slack Resources and Firm Value

Slack resources mean unique resource of a company with high uncertainty, which is fully available to achieve innovation to respond to external environmental changes [27]. In the study on the effect

of slack resource on firm value [28], a positive viewpoint is argued that slack resources help increase the number of innovations for fir value creation while reducing risk to elevate firm value [29]. On the other hand, a study based on a negative viewpoint argues that managers prefer to hold slack resources to have the discretionary power in investment decision making [30]. However, such discretion of a manager could cause moral hazard to delay innovation and divert investment in areas with unclear value creation or R&D or M&A with uncertain profit generation. As such, affluent slack resources allow overinvestment by a manager and drop firm value [31].

Company stakeholders have disparate viewpoints on slack resources. First, shareholders view inefficient resource use as decrease in shareholders' interest and argue there is no need for a company to hold slack resources [32]. On the other hand, managers stress that financial slack resources such as retained earnings have a high replace ability and can be re-arranged for diverse purposes [33]. For managers, slack resources mean retained earnings to help ease shock and risk from the external environment and are diversely available for not having a certain set purpose of use. Financial slack resources can be input to innovation activities and movable to various other activities freely [7]. Investors also recognize financial slack resources as a reward for innovation activities.

According to the agency theory, while shareholders focus on firm value improvement, managers focus on their own interest, so they deal with slack resources inefficiently. In other words, affluent slack resources mean that a manager fails to properly control performance and resource efficiency decreases [17]. Therefore, the more the slack cash in a company, the more likely the manager overinvests and engages in activities causing more M&A expenditure [34].

From the perspective of information effect of slack resource, having slack resources increases investors' concern over agency cost generation. Thus, the more the slack resources, the lower the firm value. As an alternative to this problem, a manager may expand R&D expenditure to reduce the agency cost of slack resource and improve firm value. Such a relationship between agency cost and slack resource varies according to the level of information asymmetry. That is, with serious information asymmetry, a manager would use slack resources for own private interest, possibly decreasing firm value whereas, with minor information asymmetry, agency cost would fall to reflect more of market evaluation and push up firm value.

In forms with low growth, retained earnings held instead of paying company profits to shareholders as a dividend could be overinvested in low-profitable businesses, causing agency cost. On the other hand, fast growing companies have lots of highly profitable investment opportunities so their demand for fund would rise, too. In such a situation, a manager prefers retained earnings over loan to procure funds and this, in turn, will have a positive effect on firm value.

In a rapidly changing environment, companies are accumulating internal funds to make use of retained earnings for enhanced innovative capacity as their continued competitive edge [35]. Companies with strong innovative capacity, in particular, need continued R&D investment along with reasonable slack resources to cover this. Lee and Wu [36] contended that if retained earnings were generated from R&D investment, it would positively affect the company's market value. Such slack resources of a company interact with innovative capacity, lower R&D investment risk, lead to technology innovation and have a positive effect on new product public announcement performance. With this understanding, this present study established the following hypotheses based on the studies above;

Hypothesis 5. *A new partner at the NPP have reasonable slack resources to have a positive effect on excess return.*

Hypothesis 6. *A revocation company at the public announcement time would lack slack resources to have a negative effect on excess return.*

3. Methodology

3.1. Sample Design

This study examined part suppliers participating in the NPP of Apple iPhone and Samsung Galaxy 5 series. The specific data collection method of iPhone part suppliers is first, to collect data based on the supplier list provided in Apple's annual report [37], and secured data based on the vendor list publicly announced by Apple [38]. Then, to check the part vendors solely for iPhone, smart phones were disassembled, and vendors were confirmed on sites providing information on the technologies applied to each part [39].

Next, Samsung Galaxy S part vendors' data were collected based on the vendor list provided by Samsung's annual report. Moreover, among Samsung's vendors, Korean vendors were manually collected primarily in the KINDS (Korean Integrated News Database System). Secondarily, in the DART (Data Analysis, Retrieval and Transfer System), the corresponding companies were checked and confirmed to be the final samples of this research. To limit the vendor check solely to Galaxy 5, smart phones were disassembled, and vendors were confirmed on sites providing information on the technologies applied to each part.

Final samples selected on these criteria were 912 Apple vendors and 574 Samsung vendors, making a total of 1486 [40]. Specifically, for 10 years from 2007 to 2017, the entire vendors joining the NPP of iPhone were classified according to country as shown in Table 1. The average number of Apple iPhone vendors is 91 including 30 US firms, 26 Taiwan firms and 27 Japanese firms, showing even distribution excluding 8 South Korean firms providing key parts.

Table 1. Apple iPhone vendor classification.

Year	Model	USA	Taiwan	Japan	Korea	Sum
2007	iPhone 2G	23	22	25	6	76
2008	iPhone 3G	25	23	24	6	78
2009	iPhone 3GS	30	23	27	5	85
2010	iPhone 4	29	23	22	7	81
2011	iPhone 4S	35	27	29	8	99
2012	iPhone 5	24	23	25	11	83
2013	iPhone 5S	33	36	27	9	105
2014	iPhone 6	32	27	28	9	96
2015	iPhone 6S	36	30	30	10	106
2016	iPhone 7	33	30	31	9	103
Avg.	iPhone Series	30	26.4	26.8	8	91.2
Sum	iPhone Series	300	264	268	80	912

On the other hand, for 7 years from 2010 to 2016, Galaxy S vendors were classified according to country as in Table 2. Due to the parent subsidiary model of Samsung, among the average number of 82 firms, 64 were Korean firms, showing intensive concentration on Korean firms (14 KOSPI firms, 50 KOSDAQ firms).

Table 2. Samsung Galaxy S vendor classification.

Year	Model	USA	Taiwan	Japan	Korea		Sum
					KOSPI	KOSDAQ	
2010	Galaxy S1	5	4	6	15	39	69
2011	Galaxy S2	6	4	7	12	44	73
2012	Galaxy S3	5	4	7	15	45	76
2013	Galaxy S4	6	4	7	12	56	85
2014	Galaxy S5	7	4	6	16	59	92
2015	Galaxy S6	7	4	8	15	58	92
2016	Galaxy S7	8	4	8	14	53	87
Avg.	Galaxy Series	6.3	4	7	14.1	50.6	82
Sum	Galaxy Series	44	28	49	99	354	574

This study identified stock prices of vendors and event day based on the following criteria; First, concerning daily closing price, since there could be a discrepancy between the post-ex-rights present stock price and pre-ex-rights stock price because of market factors such as rights issue/bonus issue, dividend and stock split; adjusted stock price was employed to maintain stock price continuity. Second, concerning Apple's iPhone, based on the new product announcement days of WWDC (2007–2010) and separate Apple Event-Keynote (2011–2016), each corresponding country's (US, Taiwan, Japan, South Korea) time difference was applied to adjust event days. Third, for Samsung Galaxy S, the event day was adjusted by applying the corresponding country's (US, Taiwan, Japan, South Korea) time difference based on the new product announcement day of yearly-held MWC (2010–2016). Forth, generally if these relevant events were not stock trading day, they were excluded from the study samples. Fifth, based on the event day, if additional data were less than the estimated period, they were excluded from the study samples.

Event day was defined as the new product announcement day of iPhone and Galaxy S, respectively by Apple and Samsung. iPhone was classified from 2007 to 2016 as in Table 3 based on the day announced in WWDC (Worldwide Developers Conference) and Keynote. Galaxy S, from 2010 to 2016, was classified as in Table 4 based on the day announced in The International Consumer Electronics Show (CES), MWC (Mobile World Congress), and International Funkausstellung (IFA). Specifically, iPhone 2G was first announced on 9 January 2007 then launched on 29 June. iPhone 3G, iPhone 3GS and iPhone 4 were announced in June and iPhone 4S, in October; then they were released in about 10 days from announcement. From iPhone 5 to iPhone 7, after they were announced in September then repeatedly launched in October in about 10 days on average.

Table 3. iPhone Series' new product preannouncement and launching day.

Year	Model	Preannouncement Day	Launching Day
2007	iPhone 2G	2007-01-09	2007-06-29
2008	iPhone 3G	2008-06-09	2008-07-11
2009	iPhone 3GS	2009-06-08	2009-06-19
2010	iPhone 4	2010-06-07	2010-06-24
2011	iPhone 4S	2011-10-04	2011-10-14
2012	iPhone 5	2012-09-12	2012-09-21
2013	iPhone 5S	2013-09-10	2013-09-20
2014	iPhone 6	2014-09-09	2014-09-19
2015	iPhone 6S	2015-09-09	2015-09-18
2016	iPhone 7	2016-09-07	2016-09-16

Table 4. Galaxy S Series' new product preannouncement and launching day.

Year	Model	Preannouncement Day	Launching Day
2010	Galaxy S1	2010-03-23	2010-06-24
2011	Galaxy S2	2011-02-13	2011-04-29
2012	Galaxy S3	2012-05-03	2012-06-25
2013	Galaxy S4	2013-03-14	2013-04-29
2014	Galaxy S5	2014-02-24	2014-03-27
2015	Galaxy S6	2015-03-01	2015-04-10
2016	Galaxy S7	2016-02-21	2016-03-11

Galaxy S1 was first announced on 23 March 2010, then launched on 24 June. Galaxy S2 was announced on 13 February 2011, then launched on 29 April. Galaxy S3 was announced on 3 May 2012, then launched on 25 June. Galaxy S4 was announced on 14 March 2013, then, launched on 29 April. Galaxy S5 was announced on 24 February 2014, then launched on 27 March. Galaxy S6 was announced on 1 March, then, launched on 10 April. Galaxy S7 was announced on 21 February, then launched on 11 March repeatedly each year.

The additional data and financial data necessary for this study were collected in the following method; Frist, the stock price and financial data of US, Japanese, and Taiwanese firms were collected from Osiris DB [41]. Korean companies' financial data were collected from the KIS-VALUE.

According to Gartner, an academic investigation company in the IT field, Apple maintained No. 1 position in supply chain management (hereinafter, SCM) for 10 years from 2007 to 2016. The reason is that Apple seeks to build a value-oriented SCM containing design and contents, instead of the existing efficiency-centered one. As such, Apple focuses its core competences on high value-added areas such as iPhone design, marketing and SW while outsourcing all the other procedures from parts to final assembly. Thanks to this outsourcing production strategy, Apple discovers top-notch new companies in each part area and let them join its new product development every year. By launching single models, in particular, Apple can efficiently manage SCM while guaranteeing a huge quantity for vendors to maximize synergistic effect.

On the other hand, Samsung internalized key smart phone parts provision or vertically integrated affiliated firms or smaller vendors. This vertical integration strategy helps reinforce the purchasing power for raw materials, enhancing cost competitiveness and minimize development period to enable prompt response to market change. It also allows more effective control over information security including product development and price. Its full line-up strategy, in particular, that increases market share by launching diversified derived models for each price range from low to high, as well as each country and telecommunication company helps offer expanded choices for consumers as similar same-branded products are sold at lower prices.

As explained above, Apple, the front runner in the smart phone market, focuses on consumer value; and Samsung, a second mover, on technology efficiency in selecting their own partners respectively. Based on the criteria, Apple and Samsung's vendors were classified into new partner, old partner, and revocation partner (see Tables 5 and 6).

Table 5. Apple iPhone's vendor volatility.

Year	Model	New Partner	Old Partner	Revocation Partner	Sum
2007	iPhone 2G	76			76
2008	iPhone 3G	5	73	3	75
2009	iPhone 3GS	9	76	2	83
2010	iPhone 4	5	76	7	74
2011	iPhone 4S	19	80	9	90
2012	iPhone 5	6	77	3	80
2013	iPhone 5S	14	91	5	100
2014	iPhone 6	6	90	6	90
2015	iPhone 6S	9	97	7	99
2016	iPhone 7	8	95	8	95
Sum	iPhone Series	157	755	50	862

Table 6. Samsung Galaxy S's vendor volatility.

Year	Model	New Partner	Old Partner	Revocation Partner	Sum
2010	Galaxy S1	69			69
2011	Galaxy S2	7	66	3	70
2012	Galaxy S3	9	67	4	72
2013	Galaxy S4	14	71	5	80
2014	Galaxy S5	18	74	10	82
2015	Galaxy S6	12	80	12	80
2016	Galaxy S7	8	79	13	74
Sum	Galaxy S Series	137	437	47	527

Table 5 exhibits the numbers of new or revocation Apple iPhone partners. Starting from the initial 76 partners selected in 2007; 75 in 2008; 83 in 2009; 74 in 2010; 90 in 2011; 80 in 2012; 100 in 2013;

90 in 2014; 99 in 2015; and 95 in 2016 partners were selected to make the total 862. Many of them are consecutive partners so the numbers of new partners and old partners were separately identified in each year. Consecutively, during the sample period, 157 companies were new partners and 755, old partners. On the other hand, 50 companies were revocation partners who lost their partnership in the previous year.

Table 6 exhibits the numbers of new or revocation Samsung Galaxy S partners. Starting from the initial 69 partners selected in 2010; 70 in 2011; 72 in 2012; 80 in 2013; 82 in 2014; 80 in 2015; and 74 in 2016 partners were selected to make the total 527. Many of them are consecutive partners so the numbers of new partners and old partners were separately identified in each year. Consecutively, during the sample period, 137 companies were new partners and 437, old partners. On the other hand, 47 companies were revocation partners who lost their partnership in the previous year.

3.2. Measures and Data Analysis

3.2.1. Overview of Data Analysis

This study aims to analyze the signal effect between partner volatility and firm value in in rapidly changing technical advances. To analyze the relationship in highly intensified business environment, we cased both Apple and Samsung which have bisected the premium smart phone market, examining part suppliers participating in the NPP of Apple iPhone and Samsung Galaxy 5 series.

Data analysis procedures are as follow: first, to analyze the effect of a specific event on firm value, this study identified stock prices of vendors and event day, and event day was defined as the new product announcement day of iPhone and Galaxy S, respectively by Apple and Samsung. Details for the event study are described in the following Section 3.2.3. Second, to analyze the effect of company innovative capacity and slack resources on excess return, this study classified partner type into new partners, old partners, and revocation partners for cross-sectional regression analysis. In addition, Apple and Samsung's NPP joining vendors were classified into new partners and revocation partners to establish a study model to test the multiple effects of innovative capacity. Details for the analysis are presented in the following section.

3.2.2. Event Study

Event study methodology is an empirical method analyzing the effect of a specific event on firm value. It is an appropriate method to extract the effect of a specific event of an individual company on the overall stock market fluctuation. An important aspect of event study method is to set an event day, estimate excess return and set a period.

To estimate and test excess return, this study implemented event study using market model. First, the estimation period to estimate excess return was based on daily stock price data from day (-170) to day (-6) and the regression coefficient $(\hat{\alpha}, \hat{\beta})$ of individual company stock i was estimated according to OLS in Equation (1). Event day was set as the period from day -5 to day +5. During this period, change in abnormal return was investigated. The 5-day pre-event period was excluded from the estimation to rule out the effect of NPP from individual stock price estimation [42]. It is likely that, if event day is accurate and there is no previous information leakage, stock market response on a specific event is observed on day -1 and 0 [43].

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

Here, $R_{i,t}$ represents individual company i's return on day t; $R_{m,t}$, market portfolio return on day t; α_i, unique risk of individual company i; $\beta_i R_{m,t}$, change in individual company i's return according to change in the whole market; $\varepsilon_{i,t}$, individual company i's error term on day t, explaining change in a specific firm's return that cannot explain market-wide change. It is assumed as $i \cdot i \cdot d \cdot N(0, \sigma_i^2)$. Market portfolio return $R_{m,t}$ employed here is the corresponding stock exchange's composite stock

price index. The parameter of Equation (1) was estimated using regression analysis. Then, individual company i's excess return at the point t is calculated as follows;

$$AR_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i R_{m,t} \quad (2)$$

$$\mathrm{AAR}_t = \frac{1}{n}\sum_{i=1}^{N} AR_{i,t} \quad (3)$$

$$CAR(t_1, t_2) = \sum_{t=-5}^{5} AR_t \quad (4)$$

Here, $AR_{i,t}$ is excess return of individual company i on day t; $CAR(t_1, t_2)$, cumulative average excess return during the event period from t_1 to t_2 (CAR). The average excess return (AAR) means the average value of excess return calculated in each sample. The cumulative average excess return refers to the cumulative value of average excess return during the $(-5, 5)$ period.

This study employed the method by Brown and Warner [44], which assumed the independence of statistical significance of $CAR(t_1, t_2)$ and AAR_t during the derived event period as in Equation (5);

$$t_{\mathrm{AAR}_t} = \frac{\mathrm{AAR}_t}{Var(AAR_t)} \quad t_{CAR(t_1,t_2)} = \frac{CAR(t_1, t_2)}{Var(CAR(t_1, t_2))} \quad (5)$$

3.2.3. Regression Analysis

This study employs event study to estimate and test excess return to identify differentiated market response by separating Apple and Samsung NPP participating companies in the smart phone industry according to their partner volatility. In addition, to analyze the effect of company innovative capacity and slack resources on excess return, their partners were classified into new partners, old partners and revocation partners for cross-sectional regression analysis as in the model below; Generally, the variables included in the regression analysis are standardized by being divided by total asset to control the heterogeneousness of size effect [26].

New partner model:

$$NP\_AR_{i,0} = \beta_1 IC_{i,t-1} + \beta_2 SLACK_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 LEV_{i,t-1} + \beta_5 PPE_{i,t-1} + \varepsilon_i$$

Old partner model:

$$OP\_AR_{i,0} = \beta_1 IC_{i,t-1} + \beta_2 SLACK_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 LEV_{i,t-1} + \beta_5 PPE_{i,t-1} + \varepsilon_i$$

Revocation partner model:

$$RP\_AR_{i,0} = \beta_1 IC_{i,t-1} + \beta_2 SLACK_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 LEV_{i,t-1} + \beta_5 PPE_{i,t-1} + \varepsilon_i$$

Here, NP_AR = new partner's excess return on NPP day, OP_AR = old partner's excess return on NPP day, RP_AR = revocation partner's excess return on NPP day, IC = independent variable having the innovative capacity value of R&D expenditure divided by total asset, $SLACK$ = independent variable having the slack resource value of retained earning divided by total asset, $SIZE$ = control variable having the company size value of log value of total asset, LEV = control variable having the debt ratio value of total debt divided by total asset, and PPE = control value having the tangible asset ratio value of tangible asset divided by total asset.

Dependent variables are excess return (NP_AR, OP_AR, RP_AR) at the NPP point. Independent variables are the variables expected to influence NPP partner selection–innovative capacity (IC), and slack resource ($SLACK$). Control variables are the corporate characteristics variables of company

size (*SIZE*), debt ratio (*LEV*), and tangible asset ratio (*PPE*). To control the heterogeneousness of size effect due to the gap in total asset in general, the R&D expenditure was divided by total asset.

Independent variables are innovative capacity and slack resource. Companies utilize both subjective and objective methods to assess their innovative capacity [45]. Preceding studies diversely measure the proxy of innovative capacity. Specifically, the number of patents [46], variable dividing R&D personnel by total personnel [47], and R&D intensity which divides R&D expenditure by total asset are most frequently utilized. Eberhart et al. [48] said that R&D expenditure was indispensable for company competitive edge such as new product development and innovation. R&D expenditure is the long-term accumulation of company knowledge and capacity to release a new product, influencing company competitiveness and company performance positively [5]. In this sense, this present study utilizes R&D expenditure as an indication of core competence.

Slack resource is measured diversely in both financial and non-financial methods [49]. Of them the financial methods of slack resource measurement include cash and cashable assets [27], current ratio [50], quick ratio [29], ratio of working capital to sales turnover [51], and retained earnings [32]. Dechow et al. [52] contended that retained earnings exceeding normal quick ratio increases company market value. In this sense, the present study employed retained earnings as an indication of slack resource.

Control variables are company size, debt ratio, and tangible asset ratio. Company size is the natural log value of total asset. The larger the size of a partner company, the higher the performance it has in terms of innovation and growth. The smaller the company is and the fewer the company experiences are in the relevant area, its partnership with a larger company works as a higher performance factor. The reason is that a partnership with a highly reputed company has a free ride effect representing a partner company's performance. A low debt ratio may cause a company to lose profit generation opportunities. The higher the tangible asset ratio, the more positive the effect on firm value is.

4. Results and Discussion

4.1. Signal Effect of Partner Volatility

Table 7 shows the results of AAR calculation of new NPP partners of Apple iPhone and Samsung Galaxy. Specifically, the AARs of new partners were 1.78%, statistically significant at 1% level on the event day (0), positively affecting the corresponding company's stock prices. The AARs of old partners were 0.73% on the event day (0), statistically significant at 10% level, positively influencing the company's stock prices. This finding indicates that there is no information leakage effect as expected about iPhone new partners to some extent in advance by stock market investors but there is announcement effect. Figure 1 illustrates the signal effect of the new partners. Based on the finding, it was found regarding iPhone vendors that new partners on the NPP day had higher excess returns than old partners, supporting Hypothesis 1. Figure 1 illustrates the signal effect of the new partners: Apple iPhone and Samsung Galaxy S'.

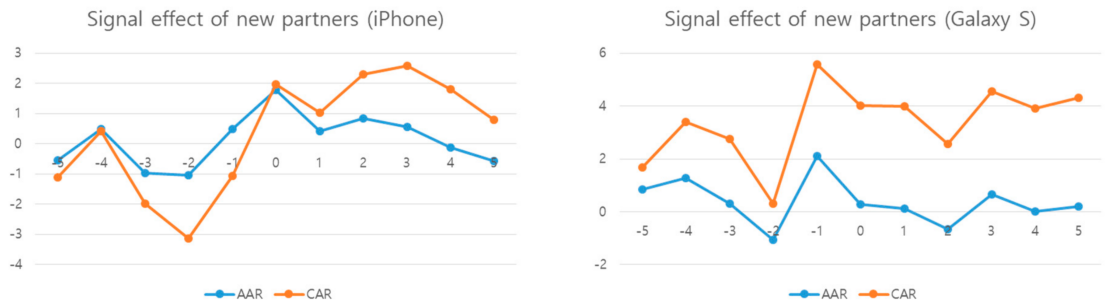

Figure 1. Signal effect of new partner of Apple iPhone and Samsung Galaxy S.

Table 7. Signal effect of new partners.

Day	iPhone (*N* = 153)				Galaxy S (*N* = 137)			
	AAR (%)	***t*-Value**	***CAR* (%)**	***t*-Value**	**AAR (%)**	***t*-Value**	***CAR* (%)**	***t*-Value**
−5	−0.55	−0.83	−0.55	−0.83	0.84	0.92	0.84	0.92
−4	0.49	0.73	−0.06	−0.07	1.28	1.41	2.12	1.65
−3	−0.96	−1.45	−1.03	−0.89	0.32	0.35	2.43	1.55
−2	−1.05	−1.57	−2.07	−1.56	−1.06	−1.17	1.37	0.75
−1	0.50	0.75	−1.57	−1.06	2.10	2.31 **	3.47	1.71
0	1.78	2.67 ***	0.20	0.12	0.27	0.30	3.74	1.68
1	0.42	0.62	0.62	0.35	0.13	0.14	3.87	1.61
2	0.84	1.27	1.46	0.78	−0.65	−0.71	3.22	1.25
3	0.56	0.84	2.02	1.01	0.67	0.73	3.89	1.43
4	−0.11	−0.17	1.91	0.91	0.01	0.01	3.90	1.36
5	−0.56	−0.83	1.35	0.61	0.21	0.24	4.11	1.36

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 8 shows the results of AAR calculation of old NPP partners of iPhone and Samsung Galaxy. Specifically, the AARs of new partners were 2.10%, statistically significant excess return at 5% level on the day before event day (−1), positively affecting the corresponding company's stock prices. The AARs of old partners were 1.33% on the day before event day (−1), statistically significant at 5% level, positively influencing the company's stock prices. This finding indicates that there exists information leakage effect as expected about Galaxy S new partners to some extent in advance on the market. Based on the finding, it was found regarding Galaxy S vendors that new partners on the day before NPP day had higher excess returns than old partners, supporting Hypothesis 1. Figure 2 describes the signal effect of the old partner of Apple iPhone and Samsung Galaxy S'.

Table 8. Signal effect of old partners.

Day	iPhone (*N* = 755)				Galaxy S (*N* = 429)			
	AAR (%)	***t*-Value**	***CAR* (%)**	***t*-Value**	**AAR (%)**	***t*-Value**	***CAR* (%)**	***t*-Value**
−5	0.69	1.61	0.69	1.61	0.28	0.45	0.28	0.45
−4	0.18	0.43	0.87	1.44	0.76	1.23	1.04	1.19
−3	−0.64	−1.50	0.23	0.31	0.15	0.24	1.18	1.11
−2	−0.26	−0.62	−0.03	−0.04	−0.32	−0.51	0.87	0.70
−1	−0.57	−1.33	−0.60	−0.63	1.33	2.16 **	2.20	1.59
0	0.73	1.71 *	0.13	0.13	0.52	0.84	2.71	1.80
1	0.32	0.75	0.45	0.40	0.18	0.29	2.89	1.77
2	0.68	1.60	1.13	0.94	−0.01	−0.02	2.88	1.65
3	0.17	0.41	1.31	1.02	0.77	1.24	3.64	1.97
4	0.57	1.34	1.88	1.40	−0.12	−0.20	3.52	1.81
5	0.07	0.16	1.95	1.38	−0.33	−0.53	3.20	1.56

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

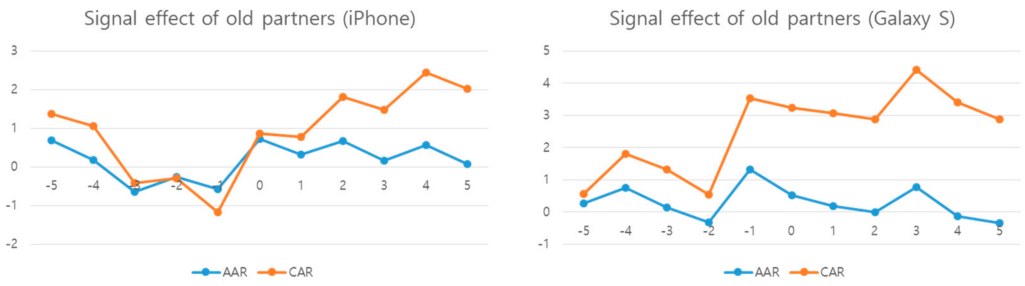

Figure 2. Signal effect of old partner of Apple iPhone and Samsung Galaxy S.

Table 9 shows the results of calculating AARs of iPhone and Samsung's revocation partners for 10 days before and after the NPP day. iPhone's revocation partner AAR was −1.92 on the event day (0), statistically significant at 1% level, negatively affecting the corresponding company. Galaxy S also showed its revocation partner AAR at −2.31% on the day before event day (−1), statistically significant excess return at 5% with a negative effect on the corresponding company's stock prices. The finding indicates there existed information leakage effect to some extent as expected in the market in advance about Galaxy S's partnership revocation. Based on the results, it was found that iPhone and Galaxy S' revocation partner firms had negative excess return, supporting Hypothesis 2. Figure 3 describes the comparison of the revocation partners between of Apple iPhone and Samsung Galaxy S'.

Table 9. Signal effect of revocation partners.

Day	iPhone (*N* = 50)				Galaxy S (*N* = 47)			
	AAR (%)	***t*-Value**	***CAR* (%)**	***t*-Value**	**AAR (%)**	***t*-Value**	***CAR* (%)**	***t*-Value**
−5	−0.48	−0.67	−0.48	−0.67	−1.31	−1.41	−1.31	−1.41
−4	−1.1	−1.53	−1.58	−1.56	0.33	0.36	−0.98	−0.74
−3	0.07	0.1	−1.51	−1.22	−1.43	−1.54	−2.41	−1.49
−2	−1.16	−1.62	−2.67	−1.86	−0.23	−0.25	−2.64	−1.42
−1	−1.12	−1.56	−3.79	−2.36	−2.31	−2.48 **	−4.95	−2.38
0	−1.92	−2.68 ***	−5.71	−3.25	−0.45	−0.48	−5.4	−2.37
1	−0.25	−0.35	−5.96	−3.14	−0.55	−0.6	−5.95	−2.42
2	−1.06	−1.48	−7.02	−3.46	−0.45	−0.49	−6.4	−2.43
3	−0.52	−0.72	−7.54	−3.5	0.46	0.49	−5.95	−2.13
4	0.03	0.04	−7.51	−3.31	−0.43	−0.46	−6.37	−2.17
5	0.98	1.37	−6.53	−2.74	0.45	0.49	−5.92	−1.92

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

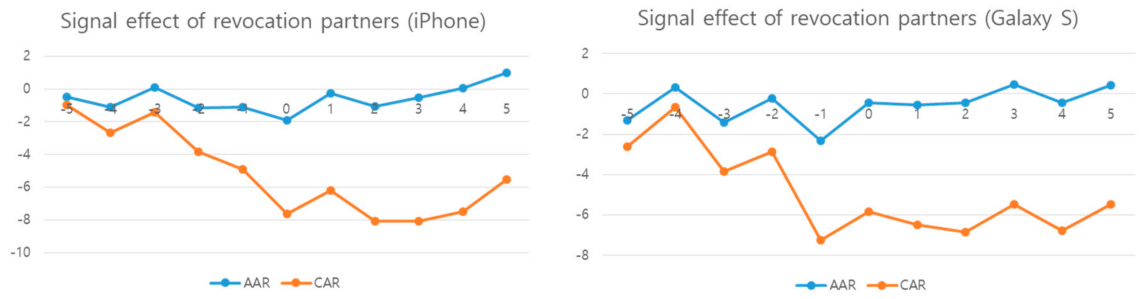

Figure 3. Signal effect of revocation partner of Apple iPhone and Samsung Galaxy S.

4.2. Effect of Company Innovative Capacity and Slack Resource on Excess Return

This study performed cross-sectional regression analysis to analyze the effect of innovative capacity and slack resource of iPhone and Galaxy S' vendors on excess return. The partner volatility of Apple iPhone was classified into new partner, old partner, and revocation partner to run regression analysis on factors influencing excess return (*AR*). VIF (variance inflation factors) values for the evaluation of multicollinearity among the independent variables included in the study model were 10 or under on average, confirming no effect of multicollinearity. The results are shown in Table 10.

Table 10. Regression analysis on excess return on iPhone NPP day.

Variables	New Partner	Old Partner	Revocation Partner
IC	0.025 ***(2.97)	0.019 **(2.11)	0.016(1.37)
SLACK	0.032(1.40)	0.027(1.52)	0.015(1.26)
SIZE	0.024 ***(2.70)	0.023 ***(2.73)	0.017 **(2.23)
LEV	0.016(1.37)	0.031(1.56)	0.019(1.13)
PPE	0.028(1.35)	0.038(1.51)	0.032(1.46)
N	157	755	50
Adjusted R^2	0.22	0.31	0.13
F	5.58 ***	6.78 ***	5.98 ***

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In the new partner model, innovative capacity is a positive coefficient significant at 1% level (0.025, $t = 2.97$). In the old partner model, it is a positive coefficient significant at 5% level (0.019, $t = 2.11$). The finding indicates that new Apple partners and old partners have a strong innovative capacity to help increase short-term firm value. Slack resource shows insignificant positive coefficients (0.032, $t = 1.40$), and (0.027, $t = 1.52$), respectively. This means that the slack resource of new partners does not influence short-term firm value at all.

In the revocation partner model, innovative capacity is an insignificant positive coefficient at (0.016, $t = 1.37$). This means that Apple's revocation partner firms have a weak innovative capacity to have zero effect on short-term firm value. Slack resource also shows an insignificant positive coefficient (0.015, $t = 1.26$). The finding means that revocation partners lack slack resources and have zero effect on short-term firm value.

The partner volatility of Samsung Galaxy S was classified into new partner, old partner and revocation partner and run regression analysis on factors influencing excess return (*AR*). The results are shown in Table 11.

Table 11. Regression analysis on excess return on Galaxy S NPP day.

Variables	New Partner	Old Partner	Revocation Partner
IC	0.017 **(2.15)	0.013 *(1.75)	0.012(1.35)
SLACK	0.029(1.53)	0.023(1.31)	0.011(1.51)
SIZE	0.018 **(2.28)	0.026 **(2.32)	0.016 *(1.87)
LEV	0.013(1.32)	0.016(1.52)	0.017(1.27)
PPE	0.012(1.39)	0.032(1.52)	0.053(1.46)
N	137	437	47
Adjusted R^2	0.21	0.29	0.15
F	6.12 ***	5.91 ***	5.98 ***

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In the new partner model, innovative capacity is a positive coefficient significant at 10% level (0.017, $t = 2.15$). In the old partner model, it is a positive coefficient significant at 10% level (0.013, $t = 1.75$). The finding indicates that new Samsung partners and old partners have a strong innovative capacity to help increase short-term firm value. Slack resource shows insignificant positive coefficients (0.029, $t = 1.53$), and (0.023, $t = 1.31$). This means that the slack resource of new partners does not influence short-term firm value at all.

In the revocation partner model, innovative capacity is an insignificant positive coefficient at (0.012, $t = 1.35$). This means that Samsung's revocation partner firms have a weak innovative capacity to have zero effect on short-term firm value. Slack resource also shows an insignificant positive coefficient (0.011, $t = 1.51$). The finding means that revocation partners lack slack resources and have zero effect on short-term firm value.

The results in Tables 10 and 11 can be interpreted that, in the stock market, investors take being a new partner to a large company such as Apple and Samsung as a positive sign and show no response

to revocation partner firms. Such a finding is consistent with the argument that a strong innovative capacity leads to active investment to move up firm value.

4.3. Multiple Effects of Innovative Capacity

Apple and Samsung's NPP joining vendors were classified into new partners and revocation partners to establish a study model to test the multiple effects of innovative capacity as below;

New partner model:

$$AR_{i,0} = \beta_1 NP\_Dummy + \beta_2 IC_{i,t-1} + \beta_3 SLACK_{i,t-1} + \beta_4 NP\_Dummy \times IC_{i,t-1} + \beta_5 SIZE_{i,t-1} + \beta_6 LEV_{i,t-1} + \beta_7 PPE_{i,t-1} + \varepsilon_i$$

Revocation partner model:

$$AR_{i,0} = \beta_1 RP\_Dummy + \beta_2 IC_{i,t-1} + \beta_3 SLACK_{i,t-1} + \beta_4 RP\_Dummy \times IC_{i,t-1} + \beta_5 SIZE_{i,t-1} + \beta_6 LEV_{i,t-1} + \beta_7 PPE_{i,t-1} + \varepsilon_i$$

Here, *AR* = dependent variable having excess return on NPP day, *NP_Dummy* = dummy variable having the value of 1 for new partner and 0 for old partner, *RP_Dummy* = dummy variable having the value of 1 for revocation partner and 0 for old partner, *IC* = independent variable having the innovative capacity value of R&D investment expenditure divided by total asset, *SLACK* = independent variable having the company slack resource of retained earnings divided by total asset, *SIZE* = control variable having the company size value of log value of total asset, *LEV* = control variable having the debt ratio of total debt divided by total asset, and *PPE* = control value having the tangible asset ratio of tangible asset divided by total asset.

Apple iPhone's partner firms were classified into new partner and revocation partner and multiple effects were tested regarding the factors influencing excess return (*AR*). The results are exhibited in Table 12.

Table 12. Multiple effects on innovative capacity of iPhone and Galaxy S vendors.

Variables	iPhone Series		Galaxy S Series	
	Model 1	**Model 2**	**Model 3**	**Model 4**
NP_Dummy	0.035 ***2.99		0.029 **2.56	
RP_Dummy		−0.025 **2.23		−0.019 **2.12
IC	0.023 ***2.92	0.0171.42	0.018 **2.05	0.0121.35
SLACK	0.0251.42	0.0131.51	0.0291.53	0.0111.31
NP_Dummy × *IC*	0.051 ***3.19		0.039 ***2.91	
RP_Dummy × *IC*		−0.0291.53		−0.0271.61
SIZE	0.026 ***2.71	0.035 ***2.36	0.027 ***2.85	0.036 **2.17
LEV	0.0151.52	0.0171.47	0.0131.41	0.0161.39
PPE	0.0321.49	0.0381.51	0.0521.59	0.0531.46
N	883	770	550	451
Adjusted R^2	0.25	0.23	0.21	0.19
F	5.53 ***	5.78 ***	4.37 ***	4.89 ***

Significance levels: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In Model 1, the innovative capacity variable of new partners showed a positive value significant at 1% level, supporting Hypothesis 3. This result demonstrates that excess return was higher in new partners than old partners because the former had a stronger innovative capacity. The multiple effects (*NP_Dummy* × *IC*) between dummy variable (*NP_Dummy*) of new partner (1 for new partner, 0 for old partner) and innovative capacity (*IC*) show a positive coefficient (0.051, $t = 3.19$) significant at 1% level. This means that new partners joining iPhone NPP have a stronger innovative capacity to reinforce excess return. On the other hand, the slack resource of new partners showed an insignificant positive value, not supporting Hypothesis 5. This means that the slack resource of a new iPhone NPP partner has zero effect on excess return.

In Model 2, the innovative capacity of revocation partners showed insignificant values, not supporting Hypothesis 4. The finding means that revocation partners tend to have a weak innovative capacity. Also, the multiple effects (*RP_Dummy* × *IC*) between the dummy variable (*RP_Dummu*) of new partner (1 for revocation partner, 0 for old partner) and innovative capacity (*IC*) show inefficient values. On the other hand, the slack resource of revocation partner shows an insignificant positive value, not supporting Hypothesis 6. It means that the slack resource of iPhone revocation partner does not influence excess return at all.

Samsung's partner firms were classified into new partner and revocation partner and multiple effects were tested regarding the factors influencing excess return (*AR*). The results are also exhibited in Table 12.

In Model 3, the innovative capacity variable of new partner shows a positive value significant at 5% level, supporting Hypothesis 3. The finding indicates that, among the companies joining Galaxy S NPP, new partners had a stronger innovative capacity than old partners to have a higher excess return. The multiple effects (*NP_Dummy* × *IC*) between the dummy variable (*NP_Dummy*) of partner (1 for new partner, 0 for old partner) and innovative capacity (*IC*) show a positive coefficient (0.039, $t = 2.91$) significant at 1% level. It means that new partners of Galaxy S NPP tend to have a stronger innovative capacity to reinforce excess return. On the other hand, the slack resource variable of new partners shows an insignificant positive value, not supporting Hypothesis 5. This means that the slack resource of new Galaxy S NPP partners has zero effect on excess return.

In Model 4, the innovative capacity of revocation partner shows an insignificant value, not supporting Hypothesis 4. This means that, among the companies joining Galaxy S NPP, revocation partners tend to have a weak innovative capacity. Also, the multiple effects 9*RP_Dummy* × *IC*) between the dummy variable (*RP_Dummy*) of new partner (1 for new partner, 0 for old partner) and innovative capacity show an insignificant positive value, not supporting Hypothesis 6. The finding indicates that the slack resource of revocation vendors of Galaxy S NPP has no effect on excess return at all.

5. Conclusions

This study looked at Apple and Samsung who bisect the premium smart phone market by classifying their partner firms for continued new product launching. This study classified partner types into three groups: new partner, old partner, and revocation partner for the last 10 years. Based on the preannouncement point, event study was performed. Research results revealed that core competence and slack resource affected the excess return on the NPP day. Apple's iPhone, as the first mover, showed public announcement effect with a positive excess return on the announcement day (0). Samsung's Galaxy S, as a fast follower, demonstrated information leakage effect with a positive excess return on the day before announcement (−1). Regarding the signal effect of partner volatility, new partners showed a positive signal effect of having higher excess return than that of old partners. Revocation partners had negative excess return, confirming a negative signal effect. The innovative capacity and slack resource of vendors joining NPP were analyzed to see if they had any effect on excess return according to partner volatility. As a result, in both iPhone and Galaxy S, the new partners had a stronger innovative capacity, demonstrating a more positive signal effect than that of old partners. In the stock market, investors recognize the R&D capacity of new partners to large companies such as Apple as a positive signal whereas that of revocation partners as a negative information.

Results include practical implications. At first, this study provides new insight for information of partner volatility in managing the global supply chain. Managers and investors can utilize the information of partner volatility for their decision making. Second, considering the features of the smart phone industry, this study identified that strategic alliance is more profitable than direct technology development to quickly accommodate innovative technologies. Third, comparing Apple and Samsung, who bisect the premium smart phone market, research results revealed that Apple solely focuses on R&D, and taking horizontal integration strategy that outsources the rests to part suppliers. On the other hand, it is revealed that Samsung takes vertical integration strategy producing core parts

such as AP, DRAM, display and battery by themselves. In addition, prior study on NNP argued that the first mover shows public announcement effect with a positive excess return on the market whereas a fast follower does not [10,11,14]. However, this study revealed that both the first mover and a fast follower have a positive public announcement effect. This study identified that the reliability of information provided to investors who invest to part suppliers mitigates asymmetry of information. To sum the study findings above, partner volatility of partner firms works as a reliable investment signal to investors and are recognized as a kind of investment index, contributing to firm value. This study is meaningful in confirming these aspects. This study is distinguished in inspecting that the differentiated innovative capacity of a new partner, in particular, is a factor helpful for new product preannouncement and a crucial variable capable of determining company survival in the smart phone market. Requirements to enhance differentiated innovative capacity are critical for partnership sustainability in the rapidly changing business environment.

Some limitations of this work present interesting directions for future research. First, as the theory can be strengthened by utilizing multiple examples, to improve the ability to generalize findings, further studies will be needed to extend the research area. Moreover, to generalize findings, future study would require comparative studies between at least two different industries or global regions. In addition, this study is based on cross-sectional data for analyzing the signaling effect of partner volatility on firm value. The findings only provide an analysis of the last 10 years since smart phones launched. A longitudinal approach would be required to analyze the impacts of the signaling effect of partner volatility over time, utilizing panel data through continuous monitoring. In addition, to consider long-term perspectives, future research on the impact of R&D costs and slack resource are required, utilizing methods such as Tobin's Q and Return of Asset (ROA). Lastly, the new product development, partner selection and strategic alliance is relevant to attitudes towards responding to the changing business environment, such as entrepreneurship and CSR (corporate social responsibility). Therefore, this study recommends that academic attention should be given to the theoretical relationships between attributes such as entrepreneurship and CSR that stimulate the selection of partnership also required to provide practical implications for firms' sustainable operations.

Acknowledgments: The authors would like to thank the anonymous reviewers and handling editors for their constructive comments that greatly improved this article from its original form.

Author Contributions: Insung Son developed the original idea for the study. Insung Son were responsible for data collection. Sihyun Kim conducted the data analyses. All the authors contributed to drafting the manuscript and approved the final version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

References and Notes

1. Kang, D.; Kim, S. Conceptual model development of sustainability practices: The case of port operations for collaboration and governance. *Sustainability* **2017**, *9*, 2333. [CrossRef]
2. Su, M.; Rao, V.R. New product preannouncement as a signalling strategy: An audience-specific review and analysis. *J. Prod. Innov. Manag.* **2010**, *27*, 658–672. [CrossRef]
3. Mishra, D.P.; Bhabra, H.S. Assessing the economic worth of new product pre-announcement signals: Theory and empirical evidence. *J. Prod. Brand Manag.* **2001**, *10*, 75–93. [CrossRef]
4. Lee, C.L.; Wu, H.C. How do slack resources affect the relationship between R&D expenditures and firm performance? *R&D Manag.* **2016**, *46*, 958–978.
5. Sorescu, A.; Shankar, V.; Kushwaha, T. New product preannouncements and shareholder value: Don't make promises you can't keep. *J. Mark. Res.* **2007**, *44*, 468–489. [CrossRef]
6. Daniel, P.; Pervaiz, K.A. Relationships between innovation stimulus, innovation capacity and innovation performance. *R&D Manag.* **2006**, *36*, 499–515.
7. Voss, G.B.; Sirdeshmurk, D.; Voss, Z.G. The effects of slack resources and environmental threat on product exploration and exploitation. *Acad. Manag. J.* **2008**, *51*, 147–164. [CrossRef]

8. Popma, W.T.; Waarts, E.; Wierenga, B. New product announcements as market signals: A content analysis in the DRAM chip industry. *Ind. Mark. Manag.* **2006**, *35*, 225–235. [CrossRef]
9. Homburg, C.; Bornemann, T.; Totzek, D. Preannouncing pioneering versus follower products: What should the message be? *J. Acad. Mark. Sci.* **2009**, *37*, 310–327. [CrossRef]
10. Robertson, T.; Eliashberg, J.; Rymon, T. New product announcement signals and incumbent reactions. *J. Mark.* **1995**, *59*, 1–15. [CrossRef]
11. Warren, N.; Sorescu, A. When 1 + 1 > 2: How investors react to new product releases announced concurrently with other corporate news. *J. Mark.* **2017**, *81*, 64–82. [CrossRef]
12. Joshi, A.; Hanssens, D. The direct and indirect effects of advertising spending on firm value. *J. Mark.* **2010**, *74*, 20–33. [CrossRef]
13. Homburg, C.; Vollmayr, J.; Hahn, A. Firm value creation through major channel expansions—Evidence from an event study in the U.S.; Germany, and China. *J. Mark.* **2014**, *78*, 38–61. [CrossRef]
14. Sood, A.; Tellis, J. Do innovations really pay off? Total stock market returns to innovation. *Mark. Sci.* **2009**, *28*, 442–456. [CrossRef]
15. Borah, A.; Tellis, J. Make, buy, or ally? Choice of and payoff from announcements of alternate strategies for innovations. *Mark. Sci.* **2014**, *33*, 114–133. [CrossRef]
16. Koku, P.S.; Jagpal, H.S.; Viswanath, P.V. The effect of new product announcements and preannouncement on stock price. *J. Mark. Focus. Manag.* **1997**, *2*, 183–199. [CrossRef]
17. Lee, S.H. How financial slack affects firm performance: Evidence from US industrial firms. *J. Econ. Res.* **2011**, *16*, 1–27.
18. Teece, D.J. Dynamic capabilities and strategic management. *Strateg. Manag. J.* **1997**, *18*, 509–533. [CrossRef]
19. Jeffrey, L.F.; Porter, M.E.; Stern, S. The determinants of national innovative capacity. *Res. Policy* **2002**, *31*, 899–933.
20. Subramaniam, M.; Youndt, M.A. The influence of intellectual capital on the types of innovative capabilities. *Acad. Manag. J.* **2005**, *48*, 450–463. [CrossRef]
21. Helfat, C.E.; Raubitschek, R.S. Product sequencing: Co-evolution of knowledge, capabilities and products. *Strateg. Manag. J.* **2000**, *21*, 961–979. [CrossRef]
22. George, J.A.; Papastathopoulou, P.G.; Gounaris, S.P. An empirically-based typology of product innovativeness for new financial services: Success and failure scenarios. *J. Prod. Innov. Manag.* **2001**, *18*, 324–342.
23. Bhattacharya, M.; Bloch, H. Determinants of innovation. *Small Bus. Econ.* **2004**, *22*, 155–162. [CrossRef]
24. Hottenrott, H.; Peters, B. Innovative capability and financing constraints for innovation: More money, more innovation? *Rev. Econ. Stat.* **2012**, *94*, 1126–1142. [CrossRef]
25. Afonso, P.; Nunes, M.; Paisana, A.; Braga, A. The influence of time-to-market and target costing in the new product development success. *Int. J. Prod. Econ.* **2008**, *115*, 559–568. [CrossRef]
26. Lev, B.; Sougiannis, T. The capitalization, amortization, and value-relevance of R&D. *J. Acc. Econ.* **1996**, *21*, 107–138.
27. George, G. Slack resources and the performance of privately held firms. *Acad. Manag. J.* **2005**, *48*, 661–676. [CrossRef]
28. Geiger, S.W.; Cashen, L.H. A multidimensional examination of slack and its impact on innovation. *J. Manag. Issues* **2002**, *14*, 68–84.
29. Opler, T.; Pinkowitz, L.; Stultz, R.; Williamson, R. The determinants and implications of corporate cash holdings. *J. Financ. Econ.* **1999**, *52*, 3–46. [CrossRef]
30. Jensen, M. Agency costs of free cash flow, corporate finance and takeovers. *Am. Econ. Rev.* **1986**, *76*, 323–329.
31. Dittmar, A.; Mahrt-Smith, J. Corporate governance and the value of cash holdings. *J. Financ. Econ.* **2007**, *83*, 599–634. [CrossRef]
32. Tan, J.; Peng, M.W. Organizational slack and firm performance during economic transitions: Two studies from an emerging economy. *Strateg. Manag. J.* **2003**, *24*, 1249–1263. [CrossRef]
33. Mishina, Y.; Pollock, T.G.; Porac, J.F. Are more resources always better for growth? Resource stickiness in market and product expansion. *Strateg. Manag. J.* **2004**, *25*, 1179–1197. [CrossRef]
34. Lyer, D.N.; Miller, K.D. Performance feedback, slack, and the timing of acquisitions. *Acad. Manag. J.* **2008**, *51*, 808–822.
35. Brown, S.J.; Warner, J.B. Measuring security price performance. *J. Financ. Econ.* **1985**, *8*, 205–258. [CrossRef]

36. Kim, S.; Chiang, B.G. Sustainability Practices to achieve Sustainability in International Port Operations. *Korea Pt. Econ. Assoc.* **2014**, *30*, 15–37.
37. The Data on iPhone Vendors from 2007 to 2010 Were Collected Based on the Annual Report Provided by the SEC-Operated Electronic Disclosure System Called EDGAR. Available online: www.sec.gov/edgar (accessed on 5 September 2017).
38. The data of iPhone vendors from 2011 to 2018 were collected based on Supplier List 2011-2016 provided by Apple
39. The dissembly information on iPhone and Galaxy S was collected from IFIXIT (www.ifixit.com), Chipworks (www.chipworks.com), and IHS Markit (www.technology.ihs.com) in depth
40. Europe (Germany, UK, France, etc.) was excluded from Apple and Samsung's global supply chains because of the problem of choice of market index
41. Osiris is a comprehensive database with information on approximately 80,000 listed companies across the world along with major non-listed/delisted firms such as financial statements, credit rating, estimated income, stock price data, ownership structure and company related news
42. MacKinlay, A.C. Event studies in economics and finance. *J. Econ. Lit.* **1997**, *35*, 13–39.
43. Hendricks, K.B.; Singhal, V.R. Delays in new product introductions and the market value of the firm: The consequences of being late to the market. *Manag. Sci.* **1997**, *434*, 422–436. [CrossRef]
44. Brown, S.J.; Warner, J.B. Using daily returns: The case of event studies. *J. Financ. Econ.* **1985**, *14*, 3–31. [CrossRef]
45. Zhou, K.Z.; Wu, F. Technological capability, strategic flexibility, and product innovation. *Strateg. Manag. J.* **2010**, *31*, 547–561. [CrossRef]
46. Dutta, S.; Weiss, A.M. The relationship between a firm's level of technological innovativeness and its pattern of partnership agreements. *Manag. Sci.* **1997**, *43*, 343–356. [CrossRef]
47. Belderbos, R.; Carree, M.; Lokshin, B. Cooperative R&D and firm performance. *Res. Policy* **2004**, *33*, 1477–1492.
48. Eberhart, A.C.; Maxwell, W.F.; Siddique, A.R. An examination of long-term abnormal stock returns and operating performance following R&D increases. *J. Finance* **2004**, *59*, 623–650.
49. Vanacker, T.; Collewaert, V.; Zahra, A. Slack resources, firm performance, and the institutional context: Evidence from privately held European firms. *Strateg. Manag. J.* **2017**, *38*, 1305–1326. [CrossRef]
50. Lin, W.T.; Cheng, K.Y.; Liu, Y. Organizational slack and firm's internationalization: A longituditional of high-technology firms. *J. World Bus.* **2009**, *44*, 397–406. [CrossRef]
51. Bradley, S.W.; Shepherd, D.A.; Wiklund, J. The importance of slack for new organizations facing 'tough' environments. *J. Manag. Stud.* **2011**, *48*, 1071–1097. [CrossRef]
52. Dechow, P.M.; Hutton, A.P.; Sloan, R.G. An empirical assessment of the residual income valuation model. *J. Acc. Econ.* **1999**, *26*, 1–34. [CrossRef]