**When ties to other organizations are burdensome:**

**The effect of competition and web traffic-based dependence on portals on failure of Internet firms**

**Draft**

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**ABSTRACT**

Although powerful resource-providers give access to ample benefits to resource-receivers, dependent ties to those resource providers may be burdensome for resource-receivers. Thus, we ask under what condition ties to other organization are burdensome? This paper investigates the question in the unique context of satellite Internet firms and portals where satellite Internet firms are dependent on portals providing web traffic, a critical resource for satellite Internet firms. This study suggests that while competition among satellite Internet firms increases failure rates, web traffic-based dependence of satellite firms on portals decreases failure rates. We also find that web traffic-based dependence decrease failure rates when competition is low whereas web traffic-based dependence increase failure rates when competition is high.

Keywords: Internet firms, portals, completion, dependence, failure

**INTRODUCTION**

Past research on ties to other organizations tend to find that the ties enable organizations survive longer and outcompete their competitors thanks to the complimentary resources that the organizations have access to via ties (Baum & Oliver, 1991; Dyer & Singh, 1998; Eisenhardt & Schoonhoven, 1996). This is understandable in that organizations may not have all the resources that they need to survive and thus those organizations have access to those resources outside an organization may gain and sustain competitive advantage. Especially when the resources an organization need are critical to the survival, it is not too hard to see that those organizations have access to the critical resources would be fared much better than those that do not have access to this critical resource.

At the same time, however, when an organization is missing a critical resource and the only way to get access is via another organization, past research finds that this relationship generates resource dependence (Pfeffer & Salancik, 1978). This resource dependence an organization confronts may create a significant problem to the organization that gets access to the critical resource via the ties to other organizations since the dependency makes the organization vulnerable to opportunistic behaviors of the partner organizations. Especially when the firms with critical resources hardly have to make relation-specific investments, it is not costly to terminate the relationship which makes the dependent firms gravely vulnerable. Following Pfeffer and Salancik (1978: 51), we define dependency as “the product of the importance of a given input or output to the organization and the extent to which it is controlled by a relatively few organizations.”

So we can see that the situation is complex in that it is inevitable to have access to the critical resources to survive and thus organizations that have access to the critical resources would be in a better position in competition. But, at the same time, given that the organizations vastly depend their survival on other organizations, this dependency makes these organizations vulnerable. Then the question becomes: Is it better to go alone to avoid exploitation from other organizations or is it better to go with other organizations even when the vulnerability is so evident?

To answer this puzzle, using inter-firm alliance literature and resource dependence theory, we argue that while inter-organizational relationship may add benefits to the organizations, when relation-specific investments hardly matters, those firms have access to critical resources via ties to other organizations with complementary resources may have hard time in survival. We specifically examine the relationship between satellite firms and portals in internet industry in Korea. The reason we use internet industry is that portals, while possessing critical resources that are not possessed by satellite firms, do not have to make significant relationship-specific investments with satellite internet firms. Since portals do not have to make significant relationship-specific investment, the dependency is not really mutual. Rather, while satellite internet firms have to depend on portals to generate internet traffic, portals are not dependent on satellite internet firms. This kind of asymmetric dependency would be prevalent especially when there are only limited number of portals, but numerous satellite internet firms, which is the reason we chose Korean internet industry for this study.

In this study, we identify a sample of 86 Internet firms from four commercial categories (blog/social network service, music, open market, and video sharing) in Korea over a span of 113 months (April 2002 to August 2011). This sample gives us an opportunity to study relational ties satellite internet firms have with portals and examine resource dependence relationship between the two. Because satellite Internet firms mainly depend on portals in order to secure web traffic and there are only two major portals in Korea which takes 93% of the whole market (Ham, 2012), Korean internet industry was a perfect ground for our study. By analyzing web traffic data, we find that satellite internet firms survive less when they compete for the same critical resources that are possessed by two dominant portals.

This paper is organized as follows. In the following section, we briefly explain the Internet industry. Next, we present theories and hypotheses. Data and methods are described in the fourth section. Then, we show empirical results. Finally, we provide conclusions, implication, and directions for future research.

**THE INTERNET INDUSTRY**

As Simon (1989) described, in Internet industry as information-rich world, users’ attention to various myriads of information is limited because they only have limited time available. Given this fact, opportunity cost of visiting all the potential sites on internet at the times of search is too costly and in today’s busy life the opportunity cost of doing so is extremely high. Thus, it is not hard to imagine that web traffic arising out of the users’ attention is also limited. Internet firms securing web traffic hold users’ attention and users’ visits to their sites are critical to the survival of many internet firms. Actually as online advertising business models emerged and have been activated, surely an increase in web traffic is critical to the Internet firms in their survival and revenue generation (Telang & Mukhopadhyay, 2005). Thus, it is not surprising that web traffic explains a huge part of Internet firms’ stock prices (Trueman et al., 2000). For these reasons, we can easily reach to an argument that web traffic is a very critical element for the survival and well-being of Internet firms. Interestingly internet users specify the relationships among Internet firms (Garton et al., 1998). In other words, users’ characteristics would be related to competitive relationships for web traffic among the Internet firms. The reason is that if a user visits two different sites looking for certain information, the niches of the two sites overlap., This overlapping niches means that the competition between two sites is high (Han & Park, 2001). However, when one Internet sites are hardly visited by a user while the other is frequently visited, it is unlikely that the two sites are competing for the same demographic niche. In other words, Internet firms compete in their own demographic niches consisting of web traffic.

This means that while Internet connects users, users dictate the relationship among Internet firms (Garton et al., 1998). This is because web traffic is a critical resource for Internet firms and thus Internet firms compete for web traffic (Rindova & Kotha, 2001). Many Internet shopping mall or messenger services are customized and focused on specific demographic group such as females and children. Within the same category, one Internet firm demographic focus may be different from others’ demographic focuses. In Internet space, web traffic can be considered as resource niche differentiated by multi-dimensional demographic attributes (Han & Park 2001). Therefore, the relationships among Internet firms are based on resource niches consisting of web traffic.

Internet firms can be categorized into two types broadly. The one is portals, and the other is satellite Internet firms (Shim & Lee, 2009). Portals attract users by having the web pages of the satellite Internet firms available at search. Users of portals input keywords in order to find information that they want and portals show web pages based on the keywords. Therefore, one of the most important portals’ functions is to redirect traffic to satellite Internet firms (Rindova & Kotha, 2001). In other words, there is a symbiotic relationship between portals and satellite Internet firms (Wang & Wu, 2006). Portals, however, rarely depend on a satellite Internet firm as there are numerous web pages of numberless web sites. Therefore, the symbiotic relationship between a portal and a satellite Internet firm can be viewed as an asymmetric relationship (Pfeffer & Salancik, 2003: 41).

In organizational environments consisting of interorganizational linkages, an organization with many ties to other organizations occupies a position of high status (Podolny et al., 1996). By status, we refer to, ‘a socially constructed, inter-subjectively agreed-upon and accepted ordering or ranking of individuals, groups, organizations, or activities in a social system’ (Washington & Zajac, 2005: 284). This means that the asymmetrically symbiotic interdependence relationships between portals and satellite Internet firms indicate that portals have high network status, which refers to a firm’ positional ranking in its inter-firm relations (Lin et al., 2009). Network status is related to a firm’s influence in inter-firm relationships (Washington & Zajac, 2005) and higher status indicates higher power (Castellucci & Ertug, 2010). Thus, an actor with high network status benefits from a positive resource asymmetry between actors (Gnyawali & Madhavan, 2001). In this respect, portals can have a power advantage against satellite Internet firms through their high network status.

With the statement that Internet firms compete with each other based on resource niche and that satellite Internet firms are in the asymmetrically mutualistic relationships with portals, we present theory and hypotheses in the next section.

**THEORY AND HYPOTHESES**

**Competition**

Surviving in competition is not an easy task for large and established firms. The adverse effect of competition, however, poses even greater threat to new entrepreneurial firms (Covin & Slevin, 1989). No wonder new firms show high failure rate and Stinchcombe (1965) named this phenomenon as “liability of newness.” Especially the more the firms compete for the same resources, the greater the competition among the firms seeking the same resources would be (Aldrich, 1979; Baum & Korn, 1996; Hannan & Freeman, 1977; Scherer & Ross, 1990). In Internet industry, there are so many small players. It is also these small players that need access to portals to get exposed to users. In other words, when it comes to satellite Internet firms, they depend on similar customer bases for their survival. On the other hand, larger and well-known players hardly need access to the portals since they might already have enough traffic to their sites by users.

Given this condition, the larger the number of small and young firms competing in the same market, the higher the likelihood that the firms would face fiercer competition and thus higher failure rate (Hannan & Carroll, 1992). This is why Carroll and Hannan (1989: 546) argue that competition exists when “the expansion of one unit … diminishes the viability and growth rates of others.” For sure high growth potential is attached to internet industry giving rooms for new entry in the competition. The same reason, however, can lead to high failure in that high-growth potential may attract too many new entries (Sahlman & Stevenson, 1985). This must be why Nickell (1996: 741) argues that “[p]erhaps competition works not by forcing efficiency on individual firms but by letting many flowers bloom and ensuring only the best survive.” Thus, we argue;

*Hypothesis 1: Competition among satellite Internet firms will be positively associated with the failure rates of the Internet firms*.

**Ties to other organizations as competitive advantage**

The advantages of an individual organization are often related to the advantages of the ties that an organization has. This is because an organization’s valuable resources often extend beyond its boundaries, and may be embedded in inter-firm relationships (Dyer & Singh, 1998). For instance, Powell (1996) found that biotechnology organizations with more strategic alliances have received higher market valuations from industry analysts. In addition, Miner et al. (1990) show that by being directly related to other organizations that supply resources, organizations can be buffered against environmental threats, lowering the organizations’ failure rates. Baum and Oliver (1991) showed that connections to government and community institutions enable organizations to acquire legitimacy. Thus, it is not surprising that past research finds that inter-organizational linkages allow organizations to get complementary resources and improve their strategic positions (Eisenhardt & Schoonhoven, 1996; Lin et al., 2009).

The advantage of having ties to other organizations is especially important when an organization’s critical resources lie beyond the organizational boundaries (Dyer & Singh, 1998). In a nutshell, leveraging complementary resources is one of the important ways to generate relational rents in an inter-firm relationship. Here following Dyer & Singh (1998: 666), we define complementary resources as “distinctive resources of alliance partners that collectively generate greater rents than the sum of those obtained from the individual resources of each other.”

In the Internet industry, the two forms of organizations are satellite Internet firms and portals. While satellite Internet firms may generate internet traffic on their own, it is critical to gain access to traffic via the relationship with major portals. This is because users tend to depend on portals when they look for information and the relationship the satellite Internet firms have with the major portals can help the satellite Internet firms get access to a mass traffic. The benefit of the relationship with a major portal firm is especially critical when the satellite Internet firm is new and not widely known to users. This is because it is unlikely that users would visit the satellite Internet firm’s website directly. Rather it is much more likely that the Internet users would get exposed to the satellite Internet firm’s webpage via portal search, which can be significant disadvantage for those satellite firms that do not have access to portals.

Those satellite Internet firms without such a relationship would be unlikely to get an ample traffic by internet users especially when they are new and not widely known. Given that traffic into their homepage is the first step for revenue generation for satellite Internet firms, lack of Internet traffic only would mean that the reason to stay in business is practically gone. On the other hand, those satellite firms with alliance relationship with a major portal company may get more traffic on Internet thanks to the help provided by portals, giving more reasons to stay in business. Thus, we argue;

*Hypothesis 2: Web traffic-based dependence of satellite Internet firms on portals will be negatively associated with the failure rates of the Internet firms*.

**When ties to other organizations are burdensome**

Resource dependence theory suggests that the power is centered to those who control resources that firms need (Pfeffer, 1981). Pfeffer and Salancik (1978) argue that there are two dimensions to the importance of a resource exchange: 1) the relative magnitude of exchange and 2) the criticality of the exchange. In other words, the level of dependence would be decided by how much a firm depends on the exchange with the environment and how unlikely the firms would survive should the resource is not available to the firm. This is why Casciaro and Piskorski (2005: 170) argue “dependence is a function of resource criticality and the availability of alternative providers of critical resources.” This dependency creates power imbalance between the government and firms. Since dependency leads to vulnerability, firms may try to remedy this situation making effort to minimize power asymmetry between firms. Once dependency becomes a fate, however, rather than trying to minimize power asymmetry between firms, dependent firms may try to create an environment that the dependency works to their favor given that the alternative option is not attractive.

Interestingly, as Pfeffer and Salancik (2003: 46-54) argue, problems associated with power arise not merely because organizations depend on their environment. Firms are vulnerable when their environment no longer assures stable and consistent supply of critical resources. If resources are amply provided from the environment in a stable manner, there are few problems for the firms. In addition, the problems do arise because resource-receiving organizations are not able to muster equal power. In other words, when the asymmetric relationship gets pronounced, this is time that the depending firm is vulnerable in the relationship with another firm. For these reasons, ties to other firms become more burdensome when the conditions of resources from the environment become problematic and firms are more asymmetrically dependent on another firm that possesses such critical resources, which is the timing that we want to pinpoint in our research.

For our purposes, we consider two factors: relationship-specific investment and competitions. Relationship-specific investment is time or cost to build or maintain relationships. If the relationship is discontinued, the investment become useless like sunk cost. If the relationship-specific investment occurs to both resource-providing and resource-receiving firms, both are dependent on each other, symmetric dependence. On the other hand, when relation-specific investment is hardly essential, it is likely that resource-possessing firms can costlessly terminate the relationship with resource-seeking firms, which creates asymmetric dependence by the resource-seeking firms.

In this sense, it makes perfect sense to look at this relationship from the resource-dependence theory. Past research on resource-dependence theory, however, while keen on the relationship between the two partner firms, paid less attention to the competition among the firms that have ties with the firms with critical resources. This is why Bae and Gargiulo (2004) argue that “[a]lthough the costs of relationships have been central to power-dependency theory (Mizruchi, 1989; Pfeffer & Salancik, 2003), the emphasis has led scholars to neglect the possible costs associated with partnerships and their distribution between alliance partners. Such costs, however, are consequential for the net returns a firm obtains from alliances.” Given that the only way to get access to the critical resources is to form alliances with the firm possessing the critical resources, it is evident that there would be fierce competition when the critical resources are concentrated in a small number of firms. In this sense, “each network tie is not only an opportunity to gain information, but also a potential leakage point” (Gnyawali & Madhavan, 2001: 436).

Then, for the question, we argue that when the firms with critical resources hardly have to make relationship-specific investment, it would be head-to-head direct competition among firms depending on the critical resources via ties. The reason is that when the firms with critical resources have to make relationship-specific investment, this would make each relationship different from each other. Under this circumstance, given that each firm makes different kind of value-generating relationship with the firm with critical resources, there won’t be head-to-head to competition. On the other hand, however, when the firms with critical resources hardly have to make relationship-specific investment, inevitably competition gets fierce leading to severe competition among the firms that have access to critical resources. The reason is that firms with critical resources hardly have to make relationship-specific investment when the critical resources they possess do not have to be tailored for each partner. Since little relationship-specific investments are made, the firms are practically competing for the same resource with little bargaining power. Plus, the fact that the resource-possessing firms hardly have to make relation-specific investment means that it incurs little cost to terminate the relationship. For this reason, it would be head-to-head direct competition.

In a sense, it resembles market competition given that the resources the firms are competing for are pretty much commodities and should one gets more resources naturally the others are only entitled for less resources. This interplay is akin to what Hannan and Freeman (1989: 140) referred to as direct competition, which occurs when firms, directly identifiable to each other, vie for the same resources.” As Baum and Korn (1996: 255) argue, “[t]he essence of rivalry is a striving by firms for potentially incompatible positions (Caves, 1984; Scherer & Ross, 1990). Thus, the direct competition gets fiercer the more firms are competing for the critical resources from a small number of resource providing firms, resulting in unstable supply of critical resources.

With asymmetry in the resource exchange relationship, resource-providing organizations can possess more advantage increasing the likelihood that the organizations will dominate inter-organizational influences (Pfeffer & Salancik, 2003). This means that resource-dependence becomes less beneficial or more harmful for the focal firms as competition surrounding the focal firm increases. Thus, we argue;

*Hypothesis 3: Web traffic-based dependence of a focal firm on portals and competition will interact* *to positively affect the Internet firm failure.*

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Insert Figure 1 about here

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**METHODOLOGY**

**Data and Sample**

Our study focuses on the Korean Internet industry. Web traffic is one of the most important competitive factors in the Internet industry. There are two sources of web traffic data: Internet firms themselves and independent measurement firms (Trueman et al., 2000). The former may not provide data at regular intervals, not define their usage measures in the same way, or have several measurement errors (Trueman et al., 2000). In order to avoid these problems, we contacted an independent measurement firm, Nielson KoreanClick. We used web traffic data by a panel of users of Nielson KoreanClick. Nielson KoreanClick generates its raw data from a random panel of 10,000 Internet users who install tracking software on their computers at home or at work. Nielson KoreanClick categorizes sites based on the nature of products or services they provide. For example, sites providing news articles, movie clips, and games are categorized into newspaper, movie, and game. Competitive relationships are mostly structured within a category in which companies are perceived as similar (Porac et al., 1995). Thus, we investigated our interests within categories of the Korean Internet industry. Following Trueman et al. (2000), we focused on commercial categories. More specifically, we selected Internet firms focusing solely on online business models. Offline firms and firms doing both online and offline business together were excluded in our sample, because their competitive space includes offline space. Among categories to which pure online Internet firms belong, we randomly selected four categories as follows: blog/social network service, music, open market, and video sharing.

We used monthly user web traffic data of sample firms from April 2002 to August 2011. The reason for using the data from April 2002 is that, although Nielson KoreanClick started collecting the data from March 2000, some data are available from or incomplete before April 2002. We mainly focused on two measures of Internet use: unique visitors (UV) and page views (PV) that studies often use (Trueman et al., 2000). The UV of a site is the estimated number of different users who visit the site during a given month. The PV of a site is the estimated number of pages viewed by users visiting the site during a given month.[[1]](#footnote-1)

We bounded our sample in three ways. First, we did not include firms that do not stay at least once in monthly top 50 of a category in terms of UV. Second, we left firms out in the sample if their reach rates (UV / the number of the panel) meaning market leadership and market share (Gallaugher & Downing, 2000) were not above one percent at least one time. We thought that a firm’s low rank and market share mean its little or no competitive strength. Also, we manually checked firms in order to identify whether they operate for commercial benefits or not. If firms are run for nonprofit goals, we excluded them in our sample. Through this process, we obtained Korean Internet users’ monthly web traffic data of 86 firms in four categories for 113 months.[[2]](#footnote-2)

**Dependent Variable and Analytical Technique**

The dependent variable is failure rate of an Internet firm. To determine the failure time of sample firms, we considered several facts. First, as of September, 2011, sites not to be connected were included in a list of sites under failure. Then, we examined sequentially the following manner in order to determine the failure time of the sites. If a criterion is met, we did not go on to the next criterion. First, by using newspaper databases in search engine such as Google and Naver, we identified the time that the sites failed. If the information is missing in the newspaper databases, we searched for the information at blogs, Internet communities, and web pages. Second, we checked the status of a site in Internet Archive (archive.org). Internet Archive builds and preserves historical web archive of digital content. So, we can track the almost entire history of a site if the site did not block the crawler bots of Internet Archive, allowing for checking whether and when the site really fails.

Finally, we regarded as failure time the first month in periods that a site’s reach rate is under one percent during at least five consecutive months. Except sites not suddenly disappearing in Nielson KoreanClick data, all failing sites showed reach rates under one percent in the long periods. We judged that a site’s reach rate below one percent during at least five consecutive months means that the site falls into a slough of failure. After this procedure, we made a dichotomous variable as the dependent variable. When a site failed at time t, we coded the variable as 1 at the time. Otherwise, we set the variable as 0. The total number of failure events was 37.

Since the dependent variable in this study was the hazard (the instantaneous probability) of an Internet firm’s failure, we used survival analysis techniques to model the hazards of failure. After collecting data and calculating variable, we constructed a panel data set. We observed events from April 2002. Some firms were already in operation before April 2002; thus, the histories of sample firms were left-censored. We used the Cox proportional hazards model (Cox, 1972), a robust technique for hazard rate analysis that does not restrict assumptions about the precise nature of a hazard’s probability distributions. The basic model can be written as:

, (1)

where , the hazard rate for firm j, is a function of the independent variables and is a vector of coefficients to be estimated.

**Independent Variables**

*Competition*. In competitive markets, firms need to identify competitors to formulate effective strategies. Size is a salient attribute to identify competitors (Porac et al. 1995). Organizational ecologists assert that competition occurs among similar-sized organizations (Baum & Mezias 1992). In fact, Internet firms monitor other firms’ size such as sales and traffics by any means to formulate and execute their business strategy based on the information. In Korea, Internet firms collect competitive intelligence information and utilize it for strategy formulation and execution by employing Internet market information and consulting companies such as Nielson KoreanClick or Rankey.com. Newspapers and other media regularly announce major firms’ pecking order based on size and other performance. In addition, size information is public and available to customers. Therefore, size is critical for the scope of competition and competition is size-localized.

Following earlier researchers (Baum & Mezias, 1992; Hannan & Ranger-Moore, 1990), we measured size-localized competition (SLC) based on the Euclidean distance of a focal firm to other firms in a category. Under the assumption that size-localized competition is a function of all the interfirm distances, *Dit* is as follows:

, (2)

where *Lit* is the position of a focal firm in a size dimension (Baum, 1995; Baum & Mezias, 1992).

But, as this measure rewards for distance (Ranger-Moore et al., 1995), researchers partially controlled for this problem by incorporating the size window that the size of a focal firms is divided by 2: (Baum & Mezias, 1992). According to this measure, a focal firm competes with only those firms whose size is within the size of the focal firm plus . Further, we considered competitive aspects in overall resource niches. Consider two organizations of the same size occupy different resource niches. If an organization is in resource niche A and the other organization is in resource niche B, the two organizations may not actually compete with each other in resource niches. However, the equation (2) may indicate the relationship between the two organizations as perfect competition.

Niche is externally given resource space in which an organization form can persist (Hannan & Freeman 1977). Therefore, resource niche is defined by age of children in Baum and Singh (1994). McPherson and his colleagues define niche of voluntary organizations according to members’ demographic distributions (McPherson et al. 1992; Popielarz and McPherson 1995). For example, some Internet shopping mall or messenger services are customized and focused on specific demographic group such as females and children. Within the same category, one Internet firm demographic focus may be different from others’ demographic focuses. In Internet space, web traffic can be considered as resource niche differentiated by multi-dimensional demographic attributes (Han & Park 2001).

Therefore, Internet firms compete in demographic resource niches consisting of web traffic. Thus, we compared the position of a focal firm in demographic dimensions, *Nit*, to the positions of all other firms, *Njt*, at time *t* in a category.[[3]](#footnote-3) The differences between the positions of the focal firm and other firms are converted to the Euclidean distance, as follows:

. (3)

In equation (3), *Nidt* is the ratio of web traffic of firm *i* in a demographic dimension *d* at time *t* to total web traffic of the firm *i* at the time *t* and n is the number of firms within the size window of the focal firm *i*. Large values of mean more intense competition.

*Web traffic-based dependence on portals*. Web traffic-based dependence on portals was measured by the ratio of a firm’s web traffic from major portals to its total web traffic in terms of PV. We regarded Naver and Daum as Korean major portals based on monthly portal rankings. As of September 2011, Naver and Daum had about 92% of a portal market share (Hong, 2011). And, as of June 2011, Naver and Daum occupied about 95% of outflow web traffic from total search ads of Korean portals (AceCounter, 2011). Although Google is dominant player globally, its presence is relatively weak in some countries such as Korea. Google has small market share, just two percentage of Korean market during the period of first half of 2012 (Ham 2102).

Researchers studying resource dependence have used inter-industry resources flows in order to measure inter-organizational dependence (Casciaro & Piskorski, 2005). This measure is based on Burt's (1980) operationalization of dependence between firms based on input-output patterns of transactions across industries. However, the measure does not directly reflect dependence at the firm level (Casciaro & Piskorski, 2005; Finkelstein, 1997). In order to handle the problem, we focused on data of web traffic referral. This data include input-output web traffic among sites. If a user from other sites comes in a focal site, this creates inflow web traffic. If a user from a focal site moves into other sites, this creates outflow web traffic. All these web traffic may be not based on decisions or behaviors of Internet firms. Some portion of web traffic may be due to decisions or behaviors of Internet users. Other portion of web traffic can be made by contracts or cooperation between Internet firms such as advertising contracts, strategic alliances, and so on. Therefore, web traffic referral represents a part of resource flows between Internet firms made by decisions or behaviors of the firms.

Especially, satellite Internet firms contract advertising with portals. Satellite Internet firms give money to portals, and portals redirect web traffic to the satellite Internet firms through traditional banner ads or contextual ads (Goldfarb & Tucker, 2011). Thus, at least, we can measure asymmetric resource dependence between satellite Internet firms and portals by using web traffic referral.

We standardize independent variables with mean of zero and standard deviation of one in order to avoid the risk of multicollinearity due to the interaction term of the independent variables.

**Control Variables**

*Organizational factors*. We controlled for several organizational factors influencing the failure rates of firms. In organization ecology, firm age and size are the important factors influencing the viability of organizations. A firm was considered to be founded in the year it first appeared in Nielson KoreanClick data. We determined the size of sample firms by applying logarithm to the PV of the sample firms. Extant studies have used sales as the size of firms (e.g., Greve, 2008; Park, 2007). PV of firms can be viewed as the sales of the firms. Also, Internet firms often invest in server computers in order to accommodate web traffic such as the PV of its sites. Therefore, PV may indicate a part of investments of Internet firms, implying that PV can indirectly represent the size of Internet firms.

Overall competition engendered by the market power of competing firms can negatively affect a focal firm. To control for the overall competition, we measured actual rivalry that a focal firm encounters based on market shares of the focal firm and its competitors:

, (4)

where *wit* is the proportion of the PV of firm *i* at time t and *Hit* is the adjusted Herfindahl measure computed for the firm *i* at time *t* (Cool, Röller, & Leleux, 1999).

Growth rate will enhance the viability of firms. We measured the growth rates of Internet firms by using the PV of the firms.

Finally, we controlled for M&A decision. Among failure events in our paper, eight events were resulted from M&A. That is, after several months from M&A, acquiring firms closed down the sites of acquired firms. The ends might be affected by our theoretical variables to some degree, but the overall variance of the ends might be due to M&A, which may bias the results of the study. Thus, we controlled the effect of M&A decision by creating dummy variable that is set to 1 at time t when a focal Internet firms is acquired.

*Environmental factors*. The extent to which resources available to firms in an industry are plentiful may affect the firms. Researchers conceptualized the factor as munificence. Organization theorists have suggested that munificence may significantly affect organization performance such as survival (Castrogiovanni, 1991; Randolph & Dess, 1984). Following this literature, we controlled for munificence by using the growth rates of categories (Dess & Beard, 1984).

One of the environmental factors influencing failure rates of organization is density (Baum & Singh, 1994). The density determines whether overall organizational relationships in a population are mutualistic or competitive. We controlled for mutualistic or competitive effects of environments at the industry level in order to verify the effects at the organization level. For category density, we considered all sites in a category at time *t*. Therefore, category density in a category at time t is the number of all sites in the category at time *t*. Finally, we controlled for category effects by making dummy variables for categories.

**RESULTS**

Table 1 shows correlations and descriptive statistics for the variables except for category dummy variables. Variance inflation factor (VIF) scores were calculated for all the variables except for dummy variables. All VIF scores were below 2.72, and the rule-of-thumb cutoff of VIF is 10 (Neter, Kutner, Wasserman, & Nachtsheim, 1996). Thus, multicollinearity was not a serious problem for regression analyses.

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Insert Table 1 about here

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Table 2 presents the results of the Cox regression. Because the Cox model inherently includes an exponential structure, we present effects based on coefficients, rather than exponentiated coefficients. Accordingly, a value of more (less) than zero increases (reduces) the likelihood of failures of Internet sites.

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Insert Table 2 about here

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Model 1 presents the baseline model that includes only control variables. The significant negative estimates for domain age, size, and growth rate indicate that the failure rate declined as age, size, and growth rate increased. The estimate for category density indicates that increases in the number of Internet sites served to increase the site failure rate, thus having a competitive effect (Hannan & Carroll, 1992). As some failure events were directly related to M&A, M&A decision has a very significant estimate. Interestingly, the effect of environmental munificence is insignificant. This result confirms the results of other research in the American cement and minicomputer industries (Anderson & Tushman, 2001). Therefore, although scholars have argued that munificence may significantly affect firms, munificence does not affect the failure rates of firms.

Hypothesis 1 predicts the negative effect of size-localized competition between Internet firms on failure rate of the firms. The hypothesis is supported by Model 2. This result explains size-based competition in resource niches reduces the viability of Internet firms.

 Hypothesis 2 predicts that web traffic-based dependence on portals is negatively related to the failure rates of Internet firms. Model 3 indicates that the coefficient of web traffic-based dependence on portals is negative but statistically insignificant. The result is not consistent with Hypothesis 2. Also, Model 3 does not provide the improvement in fit over the baseline model. This implies that the model considering only the direct effect of web-traffic dependence on portals is not a better model than the baseline model.

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Insert Figure 2 about here

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 Finally, Hypothesis 3 predicts that the greater interaction term between competition among satellite Internet firms and web traffic-based dependence on portals leads to the higher failure likelihood. Model 4 shows that the coefficient of the product of web traffic-based dependence on portals and competition is positive and statistically significant. To plot this interaction, we defined high and low on the variables of competition and web traffic-based dependence on portals as one standard deviation above or below the mean. As seen in Figure 2, both lines have different slopes. The dotted line has a positive slope and the solid line a negative slope. The two lines become wider, suggesting that when competition is high (illustrated by the dotted line), the failure probability of Internet firms tends to be higher as a result of the firms’ strengthened effects of web traffic-based dependence on portals; but when competition is low (illustrated by the solid line), the failure probability of satellite Internet firms tends to be lower (becomes negative). This result supports Hypothesis 3.

**DISCUSSION AND CONCLUSIONS**

In this study, we proposed that satellite Internet firms of similar size compete with each other in demographic resource niches of web traffic. Based on earlier research, we also proposed that web traffic-based dependence on portals reduces the failure rates of satellite Internet firms. In addition, we argued that competition weakens the negative relationship between web traffic-based dependence on portals and the failure rates of satellite Internet firms. These arguments generally received empirical support. Competition among satellite Internet firms increases the failure rates of them. Although web traffic-based dependence on portals, actors with high network status, seems to have little effect on the failure rates of satellite Internet firms, the intensity of competition determines the direction of the effect of web traffic-based dependence linkages on the failure rates of satellite Internet firms.

**Implications**

Competitive interdependence and mutualistic interdependence have been on the center of scholarly attention from studies on organizational ecology (Barnett & Carroll, 1987; Baum & Singh, 1994). But, earlier studies focused on the organizational interdependence at the population or communities of population level. As a result, they could not suggest implications at the organization level. A few papers examined together competitive interdependence and mutualistic interdependence of specific organizations. For example, Ingram and Baum (1997) considered the fate of component organizations with affiliations to chains. Although they did not consider component-specific competition in hypotheses, they reestimated competitive interdependence and mutualistic interdependence in additional analyses by including competition. Martin et al. (1998) developed a model that captures suppliers’ constraints by rival suppliers and mutualistic benefits by non-competing suppliers. Nam et al. (2010) examined the relationships between niche overlap as competition and referral alliances as mutualism in the context of professional service firms. However, those papers did not consider the interaction of competitive interdependence and mutualistic interdependence, resource dependence, and heterogeneous status. Thereby, this study makes a contribution to the literature on competitive and mutualistic interdependence.

In the Internet industry, web traffic flows are an important part of interfirm linkages. And, these flows create resource dependence among Internet firms, especially among satellite Internet firms and portals. Therefore, we focus on asymmetric resource dependence of interfirm linkages between satellite Internet firms and portals. Through this focus, we contribute to the recent ‘renaissance’ of resource dependence theory (Katila et al., 2008).

First, we introduce the web traffic-based dependence on portals. By examining the asymmetric relationship between satellite Internet firms and portals, we find that the level of competition among satellite Internet firms determines whether the web traffic-based dependence on portals is bless or curse on satellite Internet firms. Second, we present the measure of resource dependence at the firm level. Extant studies on resource dependence of firms have ignored this issue by measuring indirectly interfirm resource dependence (Casciaro & Piskorski, 2005; Finkelstein, 1997). Based on web traffic referral – i.e., resource flows – among Internet sites, we measure asymmetric resource dependence between satellite Internet firms and portals. As we argued above, the resource relationship between satellite Internet firms and portals is inherently asymmetric, inducing us to focus on the way to capture asymmetric resource dependence. Considering linkages among satellite Internet firms, future studies may capture other forms of resource dependence by using web traffic referral.

**Limitations and directions for future research**

Although this study has endeavored to advance theories, the findings should be considered in light of its limitations. The first limitation is the generalization. Although our arguments are developed for general contexts, empirical analysis is limited to the Korean Internet industry. Further studies may be able to examine the applicability of our arguments in different settings. For example, it will be interesting to extend our findings into business group affiliation as a kind of inter-organizational linkages. As Vissa et al. (2010) pointed out in their arguments, connections between firms in business group affiliation can create competition for resources and approval among affiliated firms. Thus, future research can examine the question how affiliated firms are affected by the interaction of competition and mutualism.

 A second limitation lies in the sample selection. Although the sample Internet firms are included in categories selected randomly from Nielson KoreanClick, Internet firms in categories not included our sample may have different variance. Also, we do not have web traffic data for the full history of Internet firms, leading to potential truncation bias toward those firms that existed before our research period.

Finally, our empirical results show that web traffic-based dependence on portals has insignificant effect on the failure rates of them. These results may be due to the nature of Korean Internet industry. One possibility is the lack of loyalty of users induced through contracts with portals. Another is the intensive imitation of strategies using web traffic referral by portals. Every firm imitates each other so that web traffic referral from portals is no longer differentiating strategy to provide competitive edge over rivals. Future research should investigate these potential causes more deeply.

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 **Table 1 Descriptive Statistics and correlation Matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Mean | S. D. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1. Firm age | 45.795 | 31.942 |  |  |  |  |  |  |  |  |  |
| 2. Firm size | 16.275 | 2.355 | 0.247 |  |  |  |  |  |  |  |  |
| 3. Actual rivalry | 0.015 | 0.023 | 0.247 | 0.701 |  |  |  |  |  |  |  |
| 4. Firm growth rate | 46.307 | 899.303 | -0.042 | -0.020 | -0.024 |  |  |  |  |  |  |
| 5. M&A decision | 0.002 | 0.042 | 0.008 | 0.006 | -0.010 | -0.002 |  |  |  |  |  |
| 6. Category density | 120.338 | 104.352 | -0.157 | -0.254 | -0.139 | 0.004 | 0.002 |  |  |  |  |
| 7. Environmental munificence | 1.396 | 14.781 | -0.059 | -0.007 | -0.015 | 0.007 | -0.037 | 0.106 |  |  |  |
| 8. Competitiona | 0.000 | 1 | 0.094 | 0.434 | 0.319 | -0.049 | 0.007 | -0.188 | -0.001 |  |  |
| 9. Web traffic-based dependence on portalsa | 0.000 | 1 | 0.027 | -0.269 | -0.031 | -0.022 | -0.021 | 0.201 | 0.015 | 0.097 |  |
| 10. Competition ⅹ Web traffic-based dependence on portals | 0.097 | 0.842 | -0.035 | -0.106 | -0.105 | 0.020 | -0.008 | -0.148 | -0.038 | -0.174 | 0.272 |

Notes: All correlations with absolute values greater than 0.031 are significant (*p* < 0.05, two-tailed test).

 a Standardized value.

**Table 2 Cox Regression Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Independent variables | Model 1 | Model 2 | Model 3 | Model 4 |
| Category dummies | Included | Included | Included | Included |
| Firm age | -0.024\*(0.012) | -0.023†(0.012) | -0.023†(0.012) | -0.026\*(0.012) |
| Firm size | -0.488\*\*(0.146) | -0.596\*\*\*(0.154) | -0.601\*\*\*(0.155) | -0.661\*\*\*(0.159) |
| Actual rivalry | -5.991(19.283) | -2.023(18.966) | -2.153(18.879) | 5.897(17.065) |
| Firm growth rate | -0.017\*(0.007) | -0.019\*(0.007) | -0.019\*(0.007) | -0.020\*\*(0.007) |
| M&A decision | 4.646\*\*\*(0.835) | 4.702\*\*\*(0.763) | 4.701\*\*\*(0.761) | 4.855\*\*\*(0.769) |
| Category density | 0.024\*(0.010) | 0.027\*(0.011) | 0.027\*(0.011) | 0.027\*(0.011) |
| Environmental munificence | -0.005(0.018) | -0.007(0.019) | -0.007(0.019) | -0.003(0.019) |
| Competitiona |  | 0.420\*(0.191) | 0.427\*(0.187) | 0.571\*\*(0.120) |
| Web traffic-based dependence on portalsa |  |  | -0.031(0.235) | -0.440(0.348) |
| Competition ⅹ Web traffic-based dependence on portals |  |  |  | 0.570\*(0.274) |
| Wald χ2 | 92.13\*\*\* | 88.02\*\*\* | 88.48\*\*\* | 90.12\*\*\* |
| Log-likelihood | -85.926 | -84.341 | -84.330 | -82.083 |
| D.F. | 10 | 11 | 12 | 13 |
| Chi-square ratio test |  | 3.17† | 3.192 | 7.686† |
| Number of observations | 3858 | 3858 | 3858 | 3858 |

†: p<.10 \*: p<.05 \*\*: p<.01 \*\*\*: p<.001.

a Standardized value.

Robust standard error in parentheses.

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**Figure 2 Interaction effects of competition and web traffic-based dependence on portals on Internet firm failures**



1. We regarded a firm’s site as the firm itself. Because our sample firms are pure Internet firms, their sites are only business means. Some pure Internet firms have several sites. For example, NHN in Korea have four sites: Naver (portal), Hangame (online game), me2day (social network service), and its official site. In this case, our approach may be not appropriate. However, our sample firms were solely focused on one commercial category. Except in the case of needing to refer to sites, we did not use the word ‘site’. [↑](#footnote-ref-1)
2. blog/SNS (n = 23, August 2007 ~ August 2011), music (n = 28, April 2002 ~ August 2011), open market (n = 20, April 2002 ~ August 2011), and video sharing (n = 15, November 2006 ~ August 2011). [↑](#footnote-ref-2)
3. The demographic data of Nielson KoreanClick consist of dimensions such as marital status, gender, age, job, educational background, income, and living region. These dimensions have sub-dimensions. Due to the incompleteness of data for living region, we excluded the living region dimension. Several sub-dimensions overlap within a dimension. After arranging the overlapping sub-dimensions and removing higher dimensions, we used 27 dimensions. [↑](#footnote-ref-3)