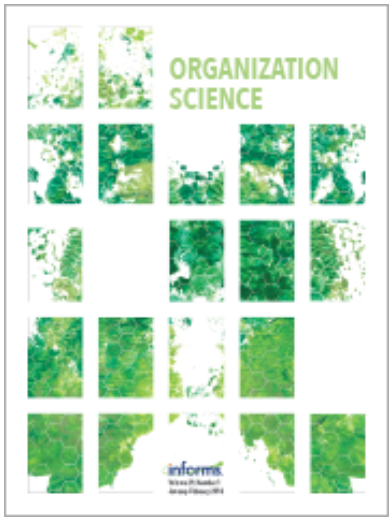

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Asymmetric Effects of Fashions on the Formation and Dissolution of Networks: Board Interlocks with Internet Companies, 1996–2006

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This paper extends the contextual perspective of network evolution to account for a more complete process of network evolution by showing that the impacts of fads and fashions on the formation and dissolution of interorganizational networks are asymmetric. Building on contact theory, this paper proposes that direct contact affords a flow of knowledge that counters tendencies to social conformity. Network dissolution differs from network formation in that partners have already obtained direct information. As a result, network dissolution is not as responsive to fads and fashions as network formation, and network structures induced by fads and fashions often survive beyond the life cycle of a fashion. An analysis of the interlocking ties of S&P 1500 firms with Internet companies from 1996 to 2006 supports the view that fads and fashions have asymmetric effects on the evolution of networks and also shows that (1) fads and fashions have a strong impact on the formation of networks but not on their dissolution, (2) the networking behaviors of organizations with direct contact are less induced by fads and fashions, and (3) the networks formed by organizations with direct contact during the heyday of a fashion survive longer.

Key words: network evolution; board interlocks; fashion; Internet firms
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Introduction

Researchers who study the evolution of interorganizational networks have started to pay more attention to social contexts as antecedents of the formation of ties. This shift is based on the increasingly prevalent recognition that although mechanisms like homophily, reciprocity, and transitivity can explain substantial variance in network formation, they are more successful in illustrating the creation of local clusters than the genesis of ties that cut across sector lines (Podolny and Page 1998, Baum et al. 2005). Sorenson and Stuart (2008) developed a contextual perspective on network formation and proposed an additional mechanism—that fads and fashions[1] encourage unconnected actors to overcome structural barriers and meet in a common setting. A logical prediction along this line of reasoning is that if an organization of a particular type suddenly experiences a surge in popularity, then it should be more attractive in eliciting network partners.

Fads and fashions have such power because they represent instances of strong social conformity in decision making. Often emerging around innovations, fads and fashions are surrounded by a sense of newness and uncertainties associated with this newness. When decision makers are unclear about the potential benefits and costs of an innovation, they are likely to rely on social information and adopt a choice that is perceived as desirable by others (Banerjee 1992, Abrahamson and Rosenkopf 1993, Strang and Macy 2001, Rogers 2003). This is especially the case when social information conveys the message that an innovation is successful, progressive, and has enormous growth potential. As a result, social conformity induces adoption and generates herding behaviors.

Because fads and fashions frequently arise from social conformity rather than rational demonstration, they tend to be transitory and fragile. Moreover, the decline of fashions can be accelerated by a counter-bandwagon that is self-reinforcing in a manner similar to the bandwagon involved in the rise of a fashion, except in the opposite direction (Abrahamson and Rosenkopf 1993). If a counter-bandwagon is operating, decision makers who look for social information to evaluate their adopted practices are likely to abandon these practices in the downswing of the fashion. Thus, given the transience of fads and fashions and the social influence they exert, one question is whether the interorganizational ties formed under the impulse of fashions will last. This is an important question in the literature because it testifies to how significant fads and fashions are as a driving force in the evolution of networks. If the network structures formed under the impulse of fashions dissolve as soon as enthusiasm wanes, then we may be at risk of overemphasizing the role of fads-and-fashions-induced networks in

bridging fragmented clusters. Thus, it is important to investigate whether the dissolution of networks is as sensitive to the rise and fall of fashions as is their formation. In addition, what are the factors that may immunize network structures from the transience of fashions?

In this paper, I build on the intergroup contact theory (Allport 1954, Pettigrew 1998), which posits that direct contact with an out-group offers learning opportunities and thus reduces a focal actor's tendency to refer to stereotypes. Contact not only allows for the flow of direct knowledge that reduces a focal actor's reliance on social wisdom, but it also supplements that knowledge with vivid self-experience that can correct inaccurate social evaluations. Extending the contact theory, I argue that, just as individuals can overcome stereotypes through their contact with an out-group, organizations should be less influenced by exaggerated social information if they have direct connections to information sources. Fads and fashions create opportunities for distant actors to meet and form relationships. Once formed, these relationships offer an opportunity to acquire direct knowledge and experience, which in turn reduces the reliance of network partners on social information and promotes independent decision making. Direct knowledge, especially if it disconfirms exaggerated or inaccurate social evaluations, should effectively impede organizations from engaging in social compliance. Thus, the dissolution of networks should be less responsive to external social information, so that the network architecture formed during the heyday of a fad or fashion can live beyond the fashion's life cycle.

An extended argument about direct knowledge is that, even in the context of network formation, the effect of fads and fashions should be attenuated among firms that have direct knowledge and experience. Organizations are less likely to conform to social influence if their direct knowledge discounts the value presented by social information. Organizations' individual assessments should both reduce their conformity to fashions in picking up network partners and improve the quality of their partner choice decisions.

I tested these propositions by analyzing the formation and dissolution of board interlocks established between Internet companies and non-Internet firms (henceforth, "conventional firms") from 1996 to 2006, which covers the Internet bubble period. I found that the enthusiasm surrounding Internet companies significantly increased the chance of tie formation between conventional firms and the Internet sector. However, once these ties were established, they were resilient to the external rise and fall of fashions. In addition, knowledge of Internet-based business models flowing from direct contact attenuated conventional firms' networking behaviors in two ways. One is that conventional firms with previous contact were less likely to be induced by fads and fashions to form ties with the Internet sector. The other is that ties that were formed by conventional firms with direct contact during the heyday of a fad or fashion lasted longer than those formed by conventional firms without direct contact during the heyday of a fad or fashion.

This paper makes four major contributions. First, I extend prior work on mechanisms affecting network evolution by showing how fads and fashions help explain not just the formation of networks but also a more complete process of network evolution. In particular, I propose a theory that combines both micro- and macroforces by emphasizing the importance of both embedding organizations' networking actions into social contexts and taking into account microstrategic reactions that generate heterogeneity rather than uniformity. By extending the contextual perspective, my study not only answers the call to expand research on network evolution (Brass et al. 2004, Zaheer and Soda 2009) but also joins a growing body of literature exploring factors that drive organizations to seek network partners beyond their local cliques (Beckman et al. 2004, Baum et al. 2005, Vissa 2012). Second, I show that fads and fashions have strong impacts on network formation but not on dissolution. This asymmetric relationship suggests that transitory forces such as fads and fashions can generate long-lasting effects on network evolution. Third, this paper simultaneously investigates the formation and dissolution of ties and contributes to remedying the lack of investigation on network dissolution. Moreover, by revealing that network formation and dissolution are asymmetric, this study argues that network dissolution is a more complicated process and deserves more research attention. Finally, whereas the prior interlock literature assumes that board interlocks tend to be relatively stable (Beckman and Haunschild 2002), this paper suggests that significant changes in interlock networks are possible under certain conditions and shows that fads and fashions are another set of antecedents in the evolution of board interlocks.

Theory

The contextual perspective has been developed to address the shortcoming in the network literature constituted by the lack of investigation of network evolution (Brass et al. 2004); especially lacking is theory that can explain the evolution of interorganizational networks that cut across sectional lines (Podolny and Page 1998, Baum et al. 2005). The contextual perspective posits that the social contexts in which potential network partners are embedded affect their chance of being connected. The change in social contexts can provide an impetus for organizations to move out of their local zones to seek network partners unconnected via convenient means such as homophily, reciprocity, transitivity, and repeated ties. The theoretical origin of the contextual perspective rests on the social foci proposition advanced by Feld (1981). Feld observed that personal relationships are often developed in a certain type of context

and argued that contexts (i.e., social foci) matter because they appeal to similar people and result in homophilous relations.

Sorenson and Stuart (2008) extended the social foci theory from interpersonal networks to interorganizational relations and built a contextual perspective of network evolution. In particular, they argued that the popularity of a setting attracts dissimilar actors by providing a point of first contact. Despite its novelty, the contextual perspective, however, has fallen short of providing a theoretical account for the evolution of networks beyond first contact. We still know relatively little about how stable these context-induced relations would be and whether organizations are equally susceptible to the influence of contexts. These are important questions because the promise of contextual variables as a driving force of network evolution lies in change. Changing environments legitimize different types of organizations as promising and validate different kinds of mingling opportunities as desirable. Consequently, the changed attitudes and beliefs shape the perceived value of adding organizations of a certain type as network partners. However, change, being either exogenous or endogenous, also sows the seeds of instability. If social contexts are changing, then network structures induced by these contextual variables are inevitably fragile. Extending the contextual perspective beyond the initial point of contact directly indicates how significant contextual factors act as a driving force in the evolution of networks. Therefore, it is critical to simultaneously test the impacts of contextual factors on network formation and dissolution.

Network dissolution is yet another topic that has received little research attention (Broschak 2004; Sullivan et al. 2007; Vissa 2011, 2012). One important reason for the lack of investigation of network dissolution is that it is often assumed to be the inverse of formation (Broschak 2004). If the factors that lead to network formation automatically prevent network dissolution, then the lack of investigation on network dissolution will not be problematic. However, if the processes of network formation and dissolution are symmetric, then the network structure induced by a changing context may be only transitory. Thus, it is important to understand network dissolution and to investigate what makes it different from network formation.

Admittedly, organizational theorists have long recognized the importance of social contexts for interorganizational networks. Researchers, especially those who investigate consequences of networks, have found that the efficacy of interorganizational diffusions depends on social contexts. For example, Davis and Greve (1997) found that interlocks were effective in diffusing poison pills but not golden parachutes, and they attributed the divergent effects to the institutional environment that affected the perceived legitimacy of different practices. Haunschild and Beckman (1998) investigated when board interlocks affected corporate behaviors and found that the availability of alternate information sources that either substituted for or complemented interlocks affected the efficacy of interlocks. Mizruchi et al. (2006) studied the contingency of the impact of board interlocks on firms' financial strategies and found that the influence of board interlocks declined over time with the changes in institutional environments. In addition, researchers have also found that the benefits of advantageous network positions are contingent on contextual factors such as national culture (Xiao and Tsui 2007). Together, these studies have focused on the consequences of networks and examined the extent to which these consequences vary across social contexts. Despite the contributions of these studies to establishing the importance of contextual factors, they have not yet treated networks per se as the subject of interest nor examined the impact of contextual factors on the evolution of networks.

Fads and Fashions as Antecedents of Network Formation

Fads and fashions are a powerful contextual force that affects organizational decision making through a process of social conformity. Researchers in psychology, economics, and sociology have offered a range of explanations for their influence. Psychologists, focusing on the motivations of individuals, have developed the concept of social validation: decision makers are more likely to follow ideas that are favored by many other people because they perceive such ideas to be more correct and valid. As Cialdini (1993, p. 131) pointed out, the reasoning underlying social validation is that "if a lot of people are doing the same thing, they must know something we don't. Especially when we are uncertain, we are willing to place an enormous amount of trust in the collective knowledge of the crowd." Extending individuals' rationales into a population-level phenomenon, the economic herding model suggests that rational decision makers who infer from others' actions their private evaluations and assume the superiority of the choice preferred by the majority will engage in accelerating cascades of choice convergence (Banerjee 1992, Bikhchandani et al. 1992). Similarly, focusing on the behaviors of organizations, Strang and Macy (2001) proposed a theory of fashions built on the thesis of the "search for excellence," where the selection pressure pushes organizations to imitate others who have been successful, resulting in a convergence in organizational practices.

Recently, network scholars have proposed that fads and fashions can explain the formation of nonlocal ties because the pressure of social conformity drives socially distant actors to participate in a common, popular setting and form relationships. For example, Sorenson and Stuart (2008) found that two distant venture capital firms are more likely to form syndicate relationships with

each other when they are both attracted by a fashionable investment setting. The fads and fashions that these authors point to are a third common "setting," the popularity of which attracts actors of the same type but who are socially distant from one another. An extension of their argument is that the popularity of certain partners itself should afford more networking opportunities as well. Thus, when the social information conveys a strong message that a certain type of organization is new and progressive, and has enormous growth potential (regardless of its technical merits), other organizations should be more likely to establish networks with organizations of this type.

HYPOTHESIS 1 (H1). *If a certain type of organization becomes fashionable, then conventional organizations are more likely to form ties with organizations of this type.*

Fads and Fashions as Antecedents of Network Dissolution

Transience of Fads and Fashions. Although the mechanisms through which fads and fashions influence organizations' behaviors are similar to those that result in institutionalization, the hallmark of fashions lies in their constant transience, which results in unstabilized practices (Zucker 1988, Abrahamson and Fairchild 1999). Fads and fashions have short life cycles, and they are sustained by exaggerated zeal for a limited period followed by a decline. Fashion scholars depict the canonical life cycle of a fashion as "a short-lived, bell-shaped, symmetric popularity curve" (Abrahamson and Fairchild 1999, p. 711).

The transience of fashions can be attributed to at least three factors. First, systematic errors can be generated with the diffusion of social information (Gilovich 1987). Information is not only "sharpened" when moving from one cascade to the next, but it also intensifies as more and more people come to hold the same attitude while the actual value remains unchanged. Second, fashions can surge in a way that is disproportionate or even irrelevant to the underlying technical merits, and consequently, they are inevitably fragile (Abrahamson and Rosenkopf 1993). Third, the process of adoption is often an emotional one in which organizations may overreact to fads and fashions (Abrahamson and Fairchild 1999). Disruptive innovations can easily provoke a sense of crisis and trigger anxieties leading to efforts to alleviate the situation. Organizations desperately jump on bandwagons that are not necessarily in their best interests. Once the crisis seems to have been alleviated, the fashionable practice is likely to be abandoned.

Because fashions are transitory and fragile, there are ample reasons to suspect that network structures may dissolve as soon as enthusiasm wanes. Just as social actors infer the value of adopting an innovation from media reports and the actions of peers, their decision to abandon an innovation is also likely to be affected by these sources of social information. A lower rate of adoption or substantial shrinkage in media reports is an indicator of discounted value. Abrahamson and Rosenkopf (1993) developed the concept of a *counter-bandwagon* to describe a negative feedback loop in the downswing of a fashion, where decreases in the number of adopters cause a drop in the bandwagon pressure, which in turn triggers more abandonments and further decreases in the number of adopters. As this negative feedback loop repeats itself, more and more rejections occur. A counter-bandwagon is more likely to form when uncertainty about the value of innovations persists even after adoption (Abrahamson 1991, Rao et al. 2001). In this circumstance, decision makers use social information to evaluate the innovations they have adopted. For example, Greve (1995) reported that radio stations that faced uncertainties regarding the future performance of current and alternative strategies examined their peers' actions to decide whether to discontinue the practices of their organizations, causing contagious abandonments.

Direct Contact and Knowledge. The fundamental reason why bandwagons or counter-bandwagons occur is that actors rely on social information to resolve uncertainties in decision making, and this results in a convergence in behaviors. Knowledge flowing from direct experience, especially that which is inconsistent with exaggerated and inaccurate social information, should curb an actor's tendency to engage in social compliance. This hypothesis is best presented by the contact theory. Building on decades of research in the social psychology of intergroup relations, scholars have concluded that contact allows a flow of direct knowledge and experience that corrects stereotypes and diminishes intergroup prejudice (Allport 1954; Pettigrew 1998, 2008). Although most of these studies were conducted at the individual level and examined how direct contact reduces personal bias based on salient individual characteristics, the insight that direct knowledge counters the effect of social categorization can improve our understanding of the impact of fashions on the evolution of networks. Organizational decision makers who have direct knowledge should rely less on social information when deciding whether to form or dissolve a tie. Moreover, direct contact with firsthand information sources provides exposure to a set of situational factors that may undermine the promise of exaggerated social information. Organizations should be able to make wiser decisions in picking up network partners because competing evaluations between direct and social information open up possibilities for choice.

Organizational scholars have documented numerous cases in which divergent information improves the quality of organizations' decision making. For example, Rao

et al. (2001) found that stock analysts who follow social clues in forecasting stock prices are able to quickly abandon their imitation once they obtain disconfirming information from their own experience. Beckman and Haunschild (2002) found that organizations that receive diverse information about acquisitions and mergers are able to pay lower premiums for their acquisitions and mergers. Strang and Kim (2004) found that organizations incorporate their own knowledge of effective actions when deciding whether to adopt fashionable management practices.

The distinct function of fashions in the networking setting is to create an opportunity for meeting. What makes the dissolution of networks different from their formation is that network partners have already met and obtained firsthand knowledge of each other. Uncertainties about network partners are greatly reduced after a direct tie has been established. Direct knowledge allows organizations to make independent judgments about the quality of their partners, rendering them less subject to the influence of fashions. Organizations that conclude that their fashionable network partners are of low quality may be more likely to abandon the ties even during the upswing of a fashion. Similarly, organizations that find their network partners to be of high quality may be more likely to retain the ties even during the downswing of a fashion. Thus, organizations that rely on direct knowledge may be less likely to conform to a counter-bandwagon and to abandon networks simply because of a drop in the bandwagon pressure.

Moreover, direct contact is especially important in discounting the impact of fashions because of the scarcity of information. Because information about an innovation may not be available from other sources and a set of standards may not have been established or widely disseminated, knowledge may be held only by those who are directly involved in the innovation. Direct contact is likely to be a major source of knowledge transfer. Thus, direct contact may lessen the effect of social influence and result in asymmetric relations between fashions and the formation and dissolution of networks.

Hypothesis 2 (H2). *The dissolution of networks is less sensitive than their formation to the fashions associated with network partners.*

An individual organization's direct knowledge should also moderate its tendency to form networks with fashionable partners. Organizations that have direct contact with fashionable network partners should be better informed about this type of partner than others. Their behavior is likely to diverge from those without direct contact in two ways. First, they should be less responsive to external fashions in forming networks with fashionable partners if they receive a disconfirming signal through their direct contact. In contrast, organizations without direct knowledge should be more likely to be induced by fashions to form networks with fashionable partners.

Second, when selecting partners, organizations with direct knowledge should make better decisions when it comes to selecting fashionable network partners. The difference in decision quality should be especially large for those ties that are formed during the heyday of a fashion, when other organizations without direct knowledge are more eager to jump on the fashion bandwagon. Thus, because the network formation decisions made by organizations with direct knowledge are less induced by fashions, their ties with fashionable partners should be formed on a sounder ground and have a lower risk of failure.

Hypothesis 3 (H3). *A conventional organization that has had prior contact with a fashionable type of network partner is less likely to form networks with such partners during the heyday of a fashion than conventional organizations without such prior contact.*

Hypothesis 4 (H4). *Networks that are formed during the heyday of a fashion by conventional organizations that have had prior contact with their fashionable type of network partner are less likely to fail than those formed in the heyday of the fashion by conventional organizations without such prior contact.*

Empirical Context: The Internet Bubble and Directorate Interlocks

Internet companies represent a new type of business model that is based on the advancement and spread of Internet technology. The rise of small Internet companies triggered a boom that began in the mid-1990s. Market confidence in the new technology and related business models fueled fads and fashions around Internet companies as well as a stock bubble. The height of the boom was marked by events like the AOL/Time Warner merger and the peak of the NASDAQ Composite Index at 5,132.52 on March 10, 2000. The bubble burst in 2001 when stock prices fell, and many Internet companies burnt through their venture capital without turning a profit. The tightening of financial conditions generated increasing skepticism about Internet companies' basic business models. As the growth of many Internet companies proved to be illusory, pessimistic views surged. The downswing of the Internet bubble was further complicated by legal scandals around some Internet companies' accounting frauds.

For a number of reasons, the Internet bubble provides an excellent context for investigating the impact of fads and fashions on the formation and dissolution of interorganizational networks. First, the Internet bubble presents a typical case in which fads and fashions emerge around a technical innovation. Social evaluation of Internet-based business models changed a lot with the rise and fall of the bubble. The boom period belief

that the Internet would, through "digital Darwinism" (Schwartz 1999) displace traditional business models was quickly replaced by the bust-period view that the Internet would not change business fundamentals and that the previously perceived gap was superficial. This change in social evaluation provides an opportunity to test the impact of fads and fashions on organizations' networking behaviors.

Second, the Internet bubble emerged around a questionable business model. The canonical Internet-based business model relied on harnessing network effects to obtain market share by operating even at a loss. The bet on future rather than current profitability resulted in significant ambiguities in evaluating these companies' qualities. However, during the boom period, the novelty of this business concept enabled some companies with flawed business plans to acquire substantial resources (Perkins and Perkins 2001). The ambiguities and uncertainties surrounding the Internet-based business models present a good context for investigating the role of social conformity in determining organizations' networking behaviors.

Last, but not least, board interlocks with Internet companies are inexpensive, trustworthy, and credible information sources for conventional firms to acquire knowledge about the Internet sector. Directorate interlocks, which happen when one company's directors or executives sit on the boards of other firms, transmit resources and information between organizations (for a review, see Mizruchi 1996). In particular, information transferred through board interlocks directly drives a firm's competitive strategy. Useem (1984) was among the first to point out that interlocks enabled managers to achieve an optical business scan of the latest competitive practices and to get a sense of the direction of future business development. Similarly, through interviewing corporate directors and executives, Lorsch and MacIver (1989) concluded that directors played an important role in firms' strategy formulations as advisors and evaluators. These conclusions have also been supported by numerous quantitative studies that show that interlocks affect firms' acquisition and merger strategies (Haunschild 1994, Haunschild and Beckman 1998, Beckman and Haunschild 2002, Beckman et al. 2004), financial strategies (Mizruchi and Stearns 1994, Mizruchi et al. 2006), and organizational strategies (Palmer et al. 1993).

In the current research context, interlocks are an especially appropriate theme for investigation because most Internet companies are still in their early stage of development and other channels of connection may not have been developed. The motivation of conventional firms was more to obtain information because they have not yet figured out how the Internet might affect them or how they can incorporate the Internet into their own operations. Amid high levels of uncertainty, board interlocks are a low-cost and convenient way to obtain information; as Haunschild and Beckman (1998, p. 817) pointed out, "[D]irectors are required for all public firms, and the information that comes from a director is thus an inexpensive by-product of such mandated relationships." In addition, there is anecdote evidence suggesting that, at the height of the Internet boom, conventional businesses actively sought Internet interlock partners. *Business Week* reported that at the time there were a lot of boards that sought talent that could help them compete against the newbies on the block (Byrnes and Judge 1999).

Method

Data

The sample for this study consisted of S&P 1500 firms from 1996 to 2006, covering the boom and bust periods of the Internet bubble. S&P 1500 firms are composed of approximately 500 large firms, 600 midsized firms, and 400 small firms. The list of S&P 1500 firms changes slightly from year to year, and the annual average addition and drop-off rates during the period involved are each about 5%. For the network formation analysis, because I studied conventional firms' construction of new ties (compared with the previous year), the final sample excluded observations pertaining to Internet companies up to the year 1996 and to organizations that appeared for the first time in other years. The final sample consisted of an unbalanced panel including 12,774 company-year observations for 2,314 companies over a period of 10 years. I compiled data on board interlocks using a list of directors of S&P 1500 firms from the Investor Responsibility Research Center (IRRC) database and a list of top executives from the Compustat ExecuComp database. For each firm, I identified a list of unduplicated names among the directors and top executives.[2] I then defined interlocked companies as those sharing at least one common name on their lists of directors and executives.[3] The data on firm size and profitability were collected from the Compustat Industrial Annual database. Data on the number of articles about the Internet sector were collected from the Factiva database. Data on the input and output trade relationships between industries were collected from the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce.

I used the 2002 North American Industry Classification System (NAICS 2002) to identify companies within the Internet sector. According to the revision report published by the Office of Management and Budget (2000), NAICS 2002 was the first industry classification system that distinguished businesses that operate mainly via the Internet from those operating in conventional ways. For observations before 2002, I used a correspondence table comparing NAICS 1997 and NAICS 2002 to match data with the NAICS 2002 classifications. In this

paper, I identify the Internet sector as consisting of firms operating via the Internet (NAICS classifications 454111 and 425110), publishing and broadcasting content on the Internet (516), providing Internet access services (5181 and 5182) or Web design (5415), or providing Internet-related training and services (611420). I list all the industries classified as belonging to the Internet sector in Online Appendix 1 (http://orgsci.journal.informs.org/).

Dependent Variables and Estimation

The first dependent variable is the *formation of Internet interlocks,* which is specified as the number of a conventional firm's interlocking companies, newly added within a year, that lie within the Internet sector. The unit of analysis is a conventional firm in a year. This count measure can better capture the influence of fashions than the proportion of interlock partners because the proportion of interlocks that are Internet companies measures not only new additions but also historical stock. Moreover, this count measure also has the advantage over other measures, such as the proportion of a firm's interlock partners initiated in each year that were Internet companies, in that it avoids the problem of having to drop all firms that did not add one interlock in a year (55% of the sample). However, using these proportion measures produces similar patterns of results as reported here.

I restricted my analysis to nonredundant ties—a tie to an Internet company was counted as a new initiation only if one focal firm was not connected to that Internet company during the previous year. This definition of an interlock tie helped to rule out potential bias caused by personnel replacement, because firms may occasionally add or drop ties when replacing a previous director with a new one. In addition, I manually checked the proxy statements of all the S&P 1500 firms excluded from the sample for two consecutive years to ensure that I had not mistakenly classified an unobserved tie in year t as a newly added tie in year $t+1$. From 1996 to 2006, I identified 781 unique interlock ties between conventional firms and Internet companies, 601 of which were initiated during this period, and 507 of which were identified as newly founded ties.[4]

Because the tie formation data constitute an unbalanced panel, I used generalized estimating equations (GEEs) (Liang and Zeger 1986), which estimate quasi-likelihood models and accommodate nonindependent observations.[5] Because the dependent variable consists of nonnegative integers with overdispersion, I estimated GEE negative binomial models with a log link function. I specified an unstructured correlation matrix, which allows any form of correlations between observations, a specification that is also favored by the quasi-likelihood information criterion test (Pan 2001, Cui 2007). I also report robust variance estimators.

One methodological concern arose in applying the model: attrition in the unbalanced panel. Attrition is problematic when the entry or drop-off patterns of observations are not random (for a review, see Baltagi and Song 2006). Verbeek and Nijman (1996) distinguished between "ignorable" and "nonignorable" patterns of missing values in an unbalanced panel. If sample attrition is ignorable for the parameters of interest, the standard panel data method can be applied to generate consistent estimation (Baltagi and Song 2006, p. 510). To test whether the attrition was ignorable, I used the variable addition test proposed by Verbeek and Nijman (1992, p. 688). The intuition is that if the missing observations are random, indicators of a firm's existence pattern in the sample should not be associated with the outcome of interests after controlling for observed covariates. Following Contoyannis et al. (2004), the test variables included (1) an indicator of whether a firm was observed in the subsequent year, (2) an indicator of whether a firm was observed in all the years, and (3) a count of the number of years observed for each company. The results show that none of these variables is related to the dependent variable at the 0.05 significance level, and thus the attrition issue in the sample is ignorable.

The second dependent variable is the *dissolution of Internet interlocks*, for which the unit of analysis is an interlock tie between a conventional firm and an Internet company. An interlock tie was coded as dissolved in a year if two firms shared at least one common director or executive in the previous year but not in the year in question. Ties that survived beyond 2006 were coded as right censored. For ties that disappeared from the sample because either the conventional partner or the Internet partner (or both) dropped out of the sample, I manually checked the proxy statements of the two companies. If an interlock tie failed in a year when either or both partners exited from the sample, the tie was coded as dissolved. Otherwise, the tie was coded as right censored. Moreover, I also considered the chance of tie reconstitution and restricted the definition of dissolution to those ties that failed in one year and were not reconstituted within the next three years. I treated the 12 ties that were reconstituted within the next three years as unbroken ties. From 1996 to 2006, 503 tie dissolutions were observed.

I modeled tie dissolution using $r(t)$, the instantaneous risk of failing. This hazard rate of failure is defined as the limiting probability of a failure between t and $t+\Delta t$, given that an interlock tie existed at t, calculated over

$$\Delta t\colon\ r(t) = \lim_{\Delta t \to o} \Pr \frac{(fail, t+\Delta t \mid exist\_t)}{\Delta t}.$$

Parametric estimates of the hazard rate require assumptions about the effect of time on failure. I used the piecewise exponential model, which allows the rate of failure to vary in an unconstrained way over preselected age ranges. Constants (baseline failure rates) were estimated

for each age period (0–1, 2–3, 4–6, and 6+).[6] I estimated a piecewise exponential model of the form $r(t) = e^{\beta X} e^{\alpha_l}$, if $t \in l_l$, where X is the vector of covariates, β is the associated vector of coefficients, and α_l is a constant coefficient associated with the lth age period. The life history of each tie was broken into one-year spells to incorporate time-varying covariates, yielding 2,259 spells; only 2,120 spells were actually used in the estimation because of missing values.

One issue in modeling the failure hazard of interlock ties is the problem of unobserved heterogeneity, which happens when there are unobserved factors that make some ties more susceptible to failure than others. For example, firms that had adopted Internet ties in earlier years might have (unobserved) structural reasons to maintain these ties longer. To control for the unobserved heterogeneities, I added a conventional firm-specific frailty variable into the piecewise exponential hazard estimation. The frailty-augmented estimation multiplies the standard hazard function with a firm-specific α_i, which accounts for the effect of one or more omitted variables (Gutierrez 2002).[7] Ties with α_i larger than its mean have a higher hazard of failure, whereas those with α_i smaller than its mean have a lower hazard of failure. In addition, a very nice feature of the frailty model is that it estimates the frailty variance θ, an insignificant estimation of which indicates little unobserved heterogeneity. More about the unobserved heterogeneity will be discussed in the Alternative Explanations section.

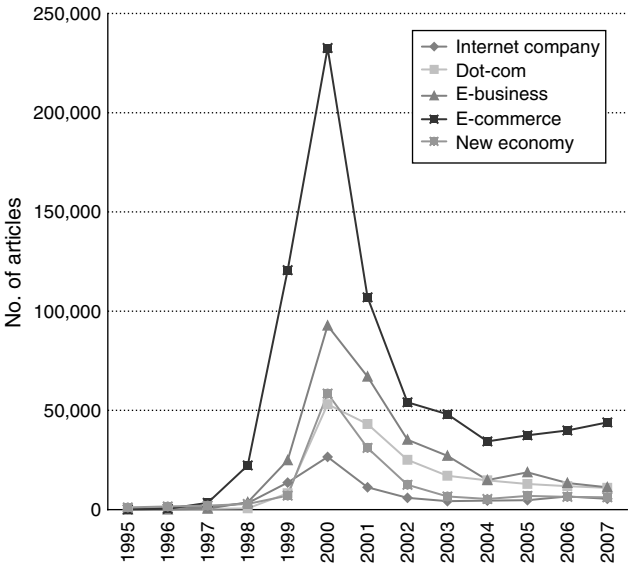
Independent Variables

The two most common variables for measuring fads and fashions are *media discourse* and *peer action* (Abrahamson and Fairchild 1999, Strang and Macy 2001). It is worth emphasizing that the focus of this paper is on examining the attenuation effect of private information on contextual influences, and thus I do not attempt to distinguish whether media reports and peer actions are indicators of a fashion or intermediaries through which a fashion affects organizations. Instead, I treat media reports and peer actions as contextual forces that exert conforming pressure on an organization's networking decision, and on this point both the proxy and the intermediary accounts agree. *Media discourse* is an important source of social information (Ruef 2000, Fiss and Hirsch 2005, Sine et al. 2005, Greve et al. 2006). A high volume of media discourse about organizations of a certain type increases the public's exposure to these organizations, and valenced discourse about their merits increases their legitimacy. Media reports are likely to serve as a source of social proof because they contain information generated by opinion leaders such as journalists, professionals, and experts (Pollock and Rindova 2003). The *actions of peers* constitute another important source of social influence. If a large number of organizations have adopted ties with organizations of a certain type, this enhances the cognitive legitimacy of these organizations. Moreover, firms within the same industry have similar resources and face similar constraints, and therefore their actions are particularly suitable to serve as a reference for social proof. In addition, the adoption behaviors of geographically proximate organizations are especially contagious because geography represents a crucial parameter of information flow between organizations (Kono et al. 1998, Almeida and Kogut 1999, Sorenson and Audia 2000).

To create the measure of valenced media reports, I first collected the number of articles from the Factiva database appearing in any one year from 1997 to 2006 that contained the keywords "Internet company," "dot-com," "e-business," "e-commerce," or "new economy." Figure 1 shows the number of articles containing these Internet-related keywords over time and confirms that the number of media reports rose and fell along with the boom and bust, respectively, of the Internet bubble. Moreover, to further evaluate the valence of media discourse, I randomly selected 1,000 articles from four leading business periodicals, the *Wall Street Journal, Financial Times, Business Week*, and *Forbes*, during the period from 1997 to 2006 (i.e., 100 articles per year). Two trained research assistants each coded 600 articles to determine whether an article manifested a positive tone toward Internet companies. In addition, the two research assistants both evaluated 20 randomly selected articles for each year. From these 200 overlapped evaluations, the Cohen's kappa of 0.869 indicated high interrater agreement.

The measure of valenced media attention is the product of the percentage of articles with positive tones and

Figure 1 Media Reports on Internet-Based Business Models



Source. Factiva Database.

the total of number of articles in a year. This variable measures the total number of articles that manifest positive attitudes toward Internet companies in a year. There are at least three advantages in adopting this measure. First, leading business periodicals set the tone of media discourse, and thus coding their articles can accurately capture the prevailing media attitude toward Internet companies. Second, using the randomly selected articles reduces the heavy burden of coding the more than 1.2 million articles into a manageable task. Third, using the product term avoids the collinearity problem when entering the volume and the valence of media reports into one regression simultaneously. In addition, I also tried other measures of media attention by using the simple amount of articles or by using the product of the percentage of articles with positive tones and the total number of articles in the four leading periodicals in a year. These measures generate results similar to those reported in this paper. Hypothesis 1 predicts that media attention will be positively related to the formation of interlock ties with the Internet sector. Hypothesis 2 predicts that media attention will not be significantly related to the hazard of dissolution of an interlock tie with the Internet sector.

I measured the percentage of adopting firms within the same industry by using the percentage of other firms with the same three-digit NAICS code that in any one year were interlocked with Internet companies from among the S&P 1500 firms. I also tried using the two-digit industry code and found the same pattern of results. I measured the percentage of adopting firms within the same geographical region by using the percentage of other conventional firms headquartered within the same metropolitan statistical area (MSA) that in any one year were interlocked with Internet companies from among the S&P 1500 firms. MSA is a relatively small geographical unit that scholars have used to define local business regions (e.g., Stuart and Sorenson 2003). The list of MSAs and their defined scope are collected from the U.S. Census Bureau. Hypothesis 1 predicts that the percentage of adoptions within an industry and within an MSA will be positively related to the formation of interlock ties with the Internet sector. Hypothesis 2 predicts that adoptions within an industry and within an MSA will not be significantly related to the dissolution of an interlock tie with the Internet sector.

A *conventional firm's contact with the Internet sector in the previous year* is a dummy variable that is coded as 1 if the conventional firm had Internet interlocks in the previous year. To test the attenuation effect of previous contact on social influence, I created interactions between this variable and the three independent variables that measure fashions: media attention, adoption within an industry, and adoption within an MSA. Hypothesis 3 predicts that these three interaction effects will be negatively related to the formation of interlocks. Similarly, when analyzing the dissolution of interlocks, I created interactions between a conventional firm's previous contacts in the founding year of an interlock tie and the three variables that measure fashions in the founding year of an interlock tie. Hypothesis 4 predicts that interactions between previous contact and media attention, adoption within an industry, and adoption within an MSA in the year of tie formation should all have negative effects on the hazard of tie dissolution.

Control Variables

A few common control variables were used for both the formation and dissolution analyses of interlocks. The first one is a conventional firm's *size*, measured as its total assets in the previous year. The second is a conventional firm's *profitability*, measured as a firm's ROA (its net income divided by its assets) in the previous year. The third is the *trade relationship* between the industries to which the conventional firms belong and the Internet sector in the previous year. Resource dependence theory predicts that board interlocks are an important mechanism for firms to manage their external resource dependence on suppliers and customers (Pfeffer and Salancik 1978, Burt 1983). I use the sum of input dependence (the percentage of inputs provided by Internet-related industries out of the total inputs that are used by each industry to produce its output) and output dependence (the percentage of commodities produced by each industry that are used by Internet-related industries) to measure trade relationships. The data were collected from the benchmark industry trade data reported by the BEA in 1997 and 2002. The benchmark data are the most detailed industry-level trade data available, reporting trade relationships among more than 483 industries at the six-digit NAICS code level. For the years in which benchmark data are not available, linear interpolation values have been inserted.

For the formation analysis of interlocks, I controlled for four other variables that may be related to the construction of networks. First, I controlled for the *annual percentage of firms that are Internet companies within the sample* to rule out the possibility that the prevalence of interlock ties with Internet companies was a spurious result from the more available Internet companies within the sample during the Internet boom period. Second, I controlled for the *number of interlocking partners that a firm had in the previous year* to control for the endogenous formation of networks (Gulati and Gargiulo 1999). Third, I controlled for the *spatial availability* of Internet companies by measuring the number of Internet companies among the S&P 1500 firms that were located within the MSA where the focal firm was headquartered in a year. Kono et al. (1998) found that corporate interlocks are a geographical phenomenon and are constrained by spatial boundaries. Finally, I controlled for the calendar *year* of observation. In additional analyses, I also

included the square term of the year to control for the boom and bust effects of Internet companies around the midpoint of the data; however, $year^2$ is highly correlated with the year and does not affect the hypothesized effects, and it has thus been omitted.

For the dissolution analysis of interlocks, I controlled for four other variables that may be related to the failure of networks. First of all, I controlled for the *size* of an Internet company, using its total assets in the previous year. Second, I controlled for the *profitability* of an Internet company using its ROA from the previous year.[8] Third, I controlled for the *direction of interlock ties*. A directional tie (i.e., a sent or received tie) is connected by a director or an executive whose primary affiliation is one network partner. In contrast, a neutral tie is connected by a director whose primary affiliation is neither of the two network partners. Network partners should have more control over the dissolution of directional ties than over neutral ties. Fourth, I controlled for the *left censoring* of interlock ties. If the year when both partners first appeared in the S&P 1500 database is later than the founding year of their interlock tie, the left censoring dummy is coded as 1. Left censoring is not a severe problem in the current research context because Internet companies are a new organizational population, and most interlock ties were formed after 1996. Nevertheless, I further checked the robustness of the results with regard to the left censoring issue by restricting analyses to those ties founded after 1996, and I found a similar pattern of results. Finally, in additional analyses, I also controlled for the continuous age of an interlock tie, defined as the number of years between a tie's founding year and the current year. I omitted this variable from the reported results, however, because it is highly correlated with tie age dummies, is not significant by itself, and does not affect hypothesized effects.

Results

Table 1 reports the descriptive statistics and correlations of all variables used in the interlock formation analysis. Table 2 reports the GEE negative binomial analysis results on tie formation. Model 1 tests the main effects of the three variables that measure social influence. The results show that a conventional firm is more likely to form interlocks with an Internet company if there is a high volume of positive media discourse ($b = 0.127$, $p < 0.05$), a high percentage of other firms within the industry that have adopted Internet interlocks ($b = 5.055$, $p < 0.01$), or a high percentage of other conventional firms within the same MSA that have adopted Internet interlocks ($b = 1.512$, $p < 0.01$) in a year. I report the three main effects together in Model 1 to save space, but they remain robust if tested separately. These findings not only confirm Sorenson and Stuart's (2008) conclusion that fads and fashions are driving forces in the formation of distant ties, but also extend the literature from an examination of the popularity of a common setting to consideration of the popularity of partners themselves. Fads and fashions strongly motivate organizations to overcome structural barriers and to form networks with fashionable partners. Hypotheses 1 is supported.

Model 2 includes the main effect of contact with Internet companies in the previous year. The coefficient is positive but not statistically significant ($b = 0.121$, n.s.). Models 3–6 test the interaction effects between previous contact and the three social influence variables. In the full model (Model 6), the attenuation effects of previous contact achieve statistical significance for all three variables: media attention ($b = -0.359$, $p < 0.05$), adoption within the industry ($b = -4.484$, $p < 0.01$), and adoption within the MSA ($b = -2.986$, $p < 0.05$). The goodness of fit for the full model is also significantly improved over the previous nested models. Combined with the main effects of social influence variables, Model 6 shows that although conventional firms without direct contact were more likely to form interlocks with Internet companies when media attention was high, those with direct contact did not increase, or even slightly decreased, their tendency to form Internet interlocks when media attention

Table 1 Descriptive Statistics for Tie Formation Estimation ($N = 12{,}774$)

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1 *Network formation*	0.03	0.20											
2 *Internet company* (%)	0.03	0.00	0.00										
3 *Internet company in MSA*	1.30	1.55	0.05	0.09									
4 *Interlock number* ($t-1$)	6.10	6.28	0.12	−0.07	0.08								
5 *Trade relationship*	0.07	0.36	0.01	0.03	0.05	−0.09							
6 *Year*	2,001.44	2.82	−0.01	0.65	0.01	−0.12	0.02						
7 *Firm asset* (in billions)	0.01	0.06	0.05	0.03	0.11	0.29	−0.03	0.06					
8 *Firm profitability*	0.04	0.14	−0.01	−0.03	−0.01	0.04	−0.02	0.00	−0.02				
9 *Media report* (in 100,000s)	0.82	0.94	0.06	0.29	0.09	0.04	0.00	−0.24	−0.02	0.00			
10 *Adoption in industry*	0.12	0.08	0.12	0.04	0.08	0.10	0.14	0.02	0.04	−0.01	0.15		
11 *Adoption in MSA*	0.13	0.11	0.06	0.04	0.41	0.08	0.05	0.02	0.05	−0.01	0.06	0.09	
12 *Internet tie* ($t-1$)	0.11	0.32	0.10	0.02	0.11	0.33	0.04	0.01	0.15	0.01	0.01	0.19	0.10

Note. The unit of analysis is a conventional firm in a year.

Table 2 GEE Negative Binomial Estimation of Tie Formation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Internet company (%)	−27.772	−27.197	−29.078	−28.970	−27.040	−32.166
	(24.010)	(23.997)	(24.068)	(23.945)	(23.998)	(24.023)
Internet company in MSA	0.075**	0.073**	0.075**	0.075**	0.075**	0.079**
	(0.033)	(0.033)	(0.032)	(0.033)	(0.033)	(0.033)
Interlock number ($t-1$)	0.067***	0.065***	0.066***	0.063***	0.065***	0.064***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Trade relationship	0.183	0.181	0.177	0.159	0.184	0.153
	(0.140)	(0.139)	(0.138)	(0.139)	(0.140)	(0.141)
Year	0.026	0.025	0.027	0.029	0.023	0.030
	(0.029)	(0.029)	(0.029)	(0.029)	(0.030)	(0.029)
Firm asset	−0.245	−0.267	−0.277	−0.326	−0.203	−0.277
	(0.697)	(0.704)	(0.708)	(0.647)	(0.733)	(0.702)
Firm profitability	−0.384**	−0.388**	−0.381**	−0.403**	−0.384**	−0.379**
	(0.182)	(0.181)	(0.181)	(0.175)	(0.181)	(0.177)
Media report	0.127**	0.122**	0.188***	0.115**	0.124**	0.232***
	(0.068)	(0.069)	(0.064)	(0.069)	(0.068)	(0.061)
Adoption in industry	5.055***	4.981***	4.977***	6.298***	5.015***	6.328***
	(0.390)	(0.399)	(0.398)	(0.442)	(0.392)	(0.442)
Adoption in MSA	1.512***	1.517***	1.474***	1.511***	2.004***	1.966***
	(0.429)	(0.426)	(0.433)	(0.402)	(0.380)	(0.379)
Internet tie ($t-1$)		0.121	0.266	0.977***	0.568**	1.640***
		(0.166)	(0.191)	(0.237)	(0.258)	(0.304)
Internet tie ($t-1$) ∗ *Media report*			−0.213			−0.359**
			(0.183)			(0.206)
Internet tie ($t-1$) ∗ *Adoption in industry*				−4.636***		−4.484***
				(1.080)		(0.988)
Internet tie ($t-1$) ∗ *Adoption in MSA*					−2.870**	−2.986**
					(1.425)	(1.522)
Constant	−56.879	−54.568	−58.720	−62.287	−50.597	−64.866
	(58.516)	(58.422)	(58.473)	(58.320)	(58.595)	(58.382)
N	12,774	12,774	12,774	12,774	12,774	12,774
χ^2	406.273	412.278	430.708	466.776	462.276	470.341

Notes. The unit of analysis is a conventional firm in a year. Standard errors are in parentheses.
**$p < 0.05$; ***$p < 0.01$ (one-sided test for hypothesized variables and two-sided test for other variables).

was high. Similarly, although conventional firms tended to increase their tendency to build Internet interlocks when a high percentage of peers had done so, the magnitude of these increases for those with direct contact was substantially smaller.

An alternative account related to direct contact is that the attenuation effect of direct contact comes not from the flow of knowledge but from a substitution effect. In other words, organizations that had had direct connections to the Internet sector in the previous year did not have as strong an incentive to establish new ties as those without direct connections, because their need for information had already been satisfied by their previous connections. If this account is true, we should expect a negative main effect of prior contact by a conventional firm on its tendency to build additional ties. However, a careful examination of Table 2 not only shows that the variable of previous contact has an insignificant main effect when tested alone but also shows significantly positive coefficients when controlling for interaction effects. Without strong conforming pressure (i.e., three fashion variables were set at their means in Model 6), conventional firms with prior contacts built 66.3% more new ties with the Internet sector than those without prior contacts. Instead, these results lend some support to the endogenous account of network formation, which suggests that existing network structures facilitate the construction of future networks (Gulati and Gargiulo 1999, Rosenkopf and Padula 2008, Zaheer and Soda 2009). Moreover, the substitution account alone has difficulty explaining why the attenuation effect is stronger when fads and fashions are high. Thus, information substitution is unlikely to have driven the attenuation effect of direct contact on tie formation. Together, these results suggest that a conventional firm that has had prior contact with the Internet sector is significantly less responsive to social influence when forming new interlocks with Internet companies, lending support to Hypothesis 3.

Table 3 Descriptive Statistics for Tie Dissolution ($N = 2{,}120$)

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9
1 *Directional tie*	0.57	0.65									
2 *Trade relationship*	1.76	0.48	−0.14								
3 *Left censored*	0.38	0.49	−0.02	0.03							
4 *Internet company asset* (in billions)	0.01	0.02	−0.05	0.10	−0.04						
5 *Internet company profitability*	0.03	0.15	−0.08	0.04	0.00	0.05					
6 *Conventional firm asset* (in billions)	0.04	0.13	−0.05	0.07	−0.07	0.13	−0.03				
7 *Conventional firm profitability*	0.04	0.14	0.06	−0.02	0.01	0.09	0.02	−0.04			
8 *Media report* (in 100,000s)	0.84	0.95	−0.03	0.01	0.07	−0.02	0.05	−0.02	−0.02		
9 *Adoption in industry*	0.17	0.08	−0.04	−0.02	0.03	0.05	−0.01	−0.01	−0.01	0.06	
10 *Adoption in MSA*	0.17	0.11	−0.02	−0.01	0.02	0.05	−0.03	0.11	0.02	0.02	0.04

Note. The unit of analysis is an existing interlock tie between a conventional firm and an Internet company in a year.

Table 3 reports the descriptive statistics and correlations of variables used in the interlock dissolution analysis. Table 4 reports the piecewise exponential frailty hazard model of tie dissolution. Model 7 reports a primary model with all control variables. Models 8–11 test the main effects of social influence on the dissolution of networks. None of the three variables has a robust impact on the hazard of tie dissolution. Moreover, none of these models shows significant improvement in the goodness of fit over the primary model, confirming the insignificant effect of fashions on the dissolution of ties. Together, these results suggest that the dissolution of Internet interlocks is not sensitive to the rise and fall of fashions in the Internet sector. These results confirm my expectation that once a conventional firm has direct contact with the Internet sector, it is capable of making independent decisions and relies less on social information. Hypothesis 2 is supported.

Table 5 reports the descriptive statistics and correlations of variables used in the moderation analysis of interlock dissolution. Because the IRRC database does not provide data on directors prior to 1996, I could only observe the percentages of Internet interlock adoption within an industry and within an MSA beginning in

Table 4 Piecewise Exponential Frailty Hazard Model on Tie Dissolution

	Model 7	Model 8	Model 9	Model 10	Model 11
Directional tie	0.195***	0.195***	0.199***	0.194***	0.198***
	(0.074)	(0.074)	(0.074)	(0.074)	(0.074)
Trade relationship	−0.150	−0.151	−0.153	−0.156	−0.159
	(0.087)	(0.087)	(0.087)	(0.087)	(0.087)
Left censored	0.167	0.169	0.176	0.171	0.179
	(0.118)	(0.118)	(0.119)	(0.118)	(0.119)
Internet company asset	−1.758	−1.758	−1.624	−1.622	−1.512
	(2.152)	(2.152)	(2.162)	(2.152)	(2.162)
Internet company profitability	−0.248	−0.247	−0.252	−0.240	−0.243
	(0.287)	(0.287)	(0.287)	(0.285)	(0.285)
Conventional firm asset	0.325	0.324	0.325	0.395	0.392
	(0.327)	(0.327)	(0.326)	(0.330)	(0.329)
Conventional firm profitability	−0.413	−0.414	−0.421	−0.406	−0.414
	(0.271)	(0.271)	(0.271)	(0.273)	(0.273)
Media report		−0.007			−0.005
		(0.049)			(0.050)
Adoption in industry			−0.425		−0.372
			(0.534)		(0.537)
Adoption in MSA				−0.706	−0.681
				(0.513)	(0.514)
N	2,120	2,120	2,120	2,120	2,120
Log likelihood	2,414.277	2,414.287	2,414.595	2,415.223	2,415.477
χ^2	1,053.750	1,053.739	1,053.458	1,052.878	1,052.643

Notes. The unit of analysis is an existing interlock tie between a conventional firm and an Internet company in a year. Standard errors are in parentheses. Dummies of tie age were included in the estimation but omitted from reporting.

$^{**}p < 0.05$; $^{***}p < 0.01$ (one-sided test for hypothesized variables and two-sided test for other variables).

Table 5 Descriptive Statistics for the Dissolution of Ties Founded After 1996 ($N = 1{,}055$)

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1 *Directional tie*	0.60	0.64													
2 *Trade relationship*	1.77	0.46	−0.13												
3 *Left censored*	0.14	0.35	0.06	0.05											
4 *Internet company asset* (in billions)	0.01	0.02	−0.16	0.10	0.00										
5 *Internet company profitability*	0.02	0.15	−0.07	−0.05	−0.01	0.07									
6 *Conventional firm asset* (in billions)	0.04	0.14	−0.05	0.07	0.01	0.16	0.03								
7 *Conventional firm profitability*	0.04	0.13	0.06	−0.02	0.01	0.09	0.03	−0.04							
8 *Media report* (in 100,000s)	0.80	0.90	0.00	−0.04	−0.03	−0.02	0.03	−0.02	0.02						
9 *Adoption in industry*	0.17	0.09	0.00	−0.01	0.14	0.08	0.02	−0.02	0.02	0.07					
10 *Adoption in MSA*	0.18	0.11	−0.02	0.02	−0.03	0.11	0.05	0.08	0.05	0.05	0.06				
11 *Media report at tie founding* (in 100,000s)	0.87	0.98	0.06	0.08	−0.08	−0.08	−0.11	−0.10	−0.03	0.25	−0.03	0.01			
12 *Adoption in industry at tie founding*	0.16	0.08	0.05	0.02	−0.02	0.10	0.00	−0.02	0.03	0.05	0.47	0.05	0.16		
13 *Adoption in MSA at tie founding*	0.16	0.11	0.03	0.00	−0.13	0.09	0.03	0.07	0.02	0.06	0.02	0.67	0.03	0.08	
14 *Internet tie* $(t-1)$ *at tie founding*	0.26	0.44	−0.08	0.02	0.27	0.19	−0.02	0.22	0.01	−0.00	0.04	0.03	−0.04	0.02	0.06

Note. The unit of analysis is an existing interlock tie between a conventional firm and an Internet company in a year.

1996. I could only observe a conventional firm's previous contact with the Internet sector (previous to the year in which a tie was founded) for ties founded beginning in 1997. Thus, the attenuation analysis of previous contact on social influence at the founding of an interlock tie is restricted to a smaller sample that includes ties that were founded after 1996 and whose conventional partners did not appear in the sample for the first time. However, despite the reduction in sample size, the descriptive statistics for the variables shown in Table 5 are largely similar to those for the full sample shown in Table 3, except that the left-censored rate is lower in the subsample. The similarity in descriptive statistics provides confidence about the representativeness of the subsample.

Table 6 reports the piecewise exponential frailty hazard models that test the moderation effect on tie dissolution of contact prior to the founding of a tie. Model 12 presents a primary model with all control variables and the three social influence variables for the year when an interlock tie was founded. The results show that there are no general predictions that can be made regarding the effects of social influence variables present at the founding of a tie on the hazard of tie dissolution. However, the profitability of Internet companies has a negative impact on the dissolution hazard of a tie ($b = -0.625$, $p < 0.10$; two-sided test), which suggests that the quality of a network partner is a factor in affecting the stability of an interlock tie. Model 13 includes the main effect of a conventional firm's previous connection to the Internet sector at the time of tie formation. The effect is not significant either ($b = -0.088$, n.s.). Models 14–17 test the moderation effect of a conventional firm's contact prior to initiation on the relationship between social influence at the time of a tie's founding and the dissolution hazard of the tie. The results show that for a conventional firm, previous contact at the time of tie founding has negative moderating effects on the impact of all three social influence variables, although only the moderation effect on media attention is statistically significant ($b = -0.562$, $p < 0.01$). This negative moderation effect remains robust when all three interaction effects are tested simultaneously in the full model, Model 17 ($b = -0.561$, $p < 0.01$). Setting other variables at their means, the life length of Internet interlocks formed when media attention was high (i.e., one standard deviation above the mean) by conventional firms with previous contact was about 6 years, whereas that by firms without prior interactions was only 3.3 years. These findings confirm the expectation that conventional firms with direct knowledge make wiser decisions in picking up partners from a new sector, whereas those without direct knowledge are more affected by bandwagons and pick up popular but not necessarily high-quality partners. Although similar patterns of results emerged for all three social influence variables, the result holds statistical confidence only for media reports. The difference may be because media reports are more likely to be laudatory and contain biases, whereas peers have direct knowledge to various degrees and engage in diversified actions, helping to reduce social conformity. Thus, Hypothesis 4 receives partial support.

Joint Estimation of the Formation and Dissolution of Internet Interlocks

The above analyses of tie formation and tie dissolution are conducted in two separate equations. The fact that the strong and significant impacts of social influence variables on the formation of interlocks stands in sharp contrast to their insignificant impacts on the dissolution

Table 6 Piecewise Exponential Frailty Hazard Model on the Dissolution of Ties Founded After 1996

	(12)	(13)	(14)	(15)	(16)	(17)
Directional tie	0.058	0.054	0.060	0.058	0.053	0.060
	(0.105)	(0.105)	(0.106)	(0.105)	(0.105)	(0.106)
Trade relationship	−0.008	−0.011	0.001	−0.017	−0.015	−0.005
	(0.133)	(0.134)	(0.134)	(0.134)	(0.134)	(0.135)
Left censored	−0.160	−0.126	−0.121	−0.128	−0.144	−0.138
	(0.210)	(0.219)	(0.220)	(0.219)	(0.223)	(0.223)
Internet company asset	−3.905	−3.627	−4.135	−3.554	−3.661	−4.199
	(3.342)	(3.372)	(3.409)	(3.381)	(3.376)	(3.428)
Internet company profitability	−0.625	−0.645	−0.725**	−0.637	−0.623	−0.709
	(0.344)	(0.347)	(0.369)	(0.348)	(0.350)	(0.371)
Conventional firm asset	0.143	0.192	0.088	0.186	0.224	0.122
	(0.430)	(0.438)	(0.434)	(0.435)	(0.443)	(0.440)
Conventional firm profitability	−0.493	−0.488	−0.487	−0.493	−0.487	−0.486
	(0.300)	(0.299)	(0.309)	(0.300)	(0.299)	(0.309)
Media report	0.055	0.055	0.040	0.054	0.056	0.041
	(0.073)	(0.073)	(0.073)	(0.073)	(0.073)	(0.073)
Adoption in industry	−0.797	−0.797	−0.567	−0.766	−0.808	−0.571
	(0.853)	(0.854)	(0.842)	(0.858)	(0.855)	(0.844)
Adoption in MSA	−0.292	−0.310	−0.198	−0.299	−0.271	−0.158
	(0.811)	(0.806)	(0.821)	(0.808)	(0.806)	(0.820)
Media report at tie founding	−0.001	−0.001	0.000	−0.001	−0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adoption in industry at tie founding	0.439	0.434	0.443	0.725	0.457	0.490
	(0.975)	(0.976)	(0.963)	(1.069)	(0.978)	(1.079)
Adoption in MSA at tie founding	−0.548	−0.516	−0.627	−0.521	−0.430	−0.540
	(0.848)	(0.843)	(0.855)	(0.844)	(0.860)	(0.873)
Internet tie $(t-1)$ *at tie founding*		−0.088	0.293	0.122	0.034	0.426
		(0.162)	(0.204)	(0.359)	(0.322)	(0.430)
Internet tie $(t-1)$ *at tie founding* ∗ *Media report at tie founding*			−0.562***			−0.561***
			(0.213)			(0.216)
Internet tie $(t-1)$ *at tie founding* ∗ *Adoption in industry at tie founding*				−1.305		−0.107
				(2.011)		(1.947)
Internet tie $(t-1)$ *at tie founding* ∗ *Adoption in MSA at tie founding*					−0.727	−0.704
					(1.683)	(1.667)
N	1,055	1,055	1,055	1,055	1,055	1,055
Log likelihood	1,326.694	1,326.843	1,331.211	1,327.056	1,326.936	1,331.305
χ^2	502.274	502.090	495.533	501.812	502.006	495.431

Notes. The unit of analysis is an existing interlock tie between a conventional firm and an Internet company in a year. Standard errors are in parentheses. Dummies of tie age were included in the estimation but omitted from reporting.

**$p < 0.05$; ***$p < 0.01$ (one-sided test for hypothesized variables and two-sided test for other variables).

of interlocks provides a straightforward confirmation of the asymmetric effects specified in H2. However, a joint estimation of the formation and dissolution of interlocks would allow for a direct comparison of the magnitude of these coefficients. I therefore adopted the joint estimation of the two dependent variables using a seemingly unrelated analysis.[9] The seemingly unrelated analysis is developed by Zellner (1962), who shows that the seemingly unrelated regression can be conceived as a generalized least square estimation in the case of linear regressions. The seemingly unrelated analysis for nonlinear dependent variables, however, has not been widely incorporated into prepackaged software.[10] An added challenge is that the dependent variable for tie formation is a count of the number of new initiations, but the dependent variable for tie dissolution is a hazard rate of tie dissolution. The current econometric technique is not readily available to account for the interdependence between two different forms of distribution (Kim 2006, Simons and Roberts 2008). Following Kim (2006) and Simons and Roberts (2008), I adopted the seemingly unrelated estimation of two equations with the same type of distributional function. In particular, I conducted two sets of seemingly unrelated analyses, one with the bivariate negative binomial and the other with the bivariate probit as the underlying joint distribution. Triangulation based on two different forms of distributions will provide an especially rigorous check of the robustness of my results.

First, I adopted the seemingly unrelated negative binomial model to analyze the formation and dissolution

of ties. The unit of analysis is a conventional firm in a year. For the equation to estimate tie formation, the dependent variable is the number of ties with Internet companies that a focal conventional firm newly formed in a year, the same as that used in the GEE negative binomial model. The sample includes all conventional firms in a year. For the equation to estimate tie dissolution, the dependent variable is the number of ties with Internet companies that a conventional firm dropped in a year. The sample includes all conventional firms that had at least one tie to the Internet sector in the previous year. I adopted the basic seemingly unrelated negative binomial (SUNB) model developed by Winkelmann (2003). However, my model is more complex in that the dissolution model estimates a conditional likelihood—tie dissolution can only happen for firms that had at least one tie at the beginning of a year, and the number of dissolutions cannot exceed the number of ties held by a firm at the beginning of a year. I used the maximum likelihood method to estimate the parameters of the conditional SUNB model and MATLAB to develop the estimation code.[11]

Second, I adopted the seemingly unrelated bivariate probit model to analyze the formation and dissolution of ties. The unit of analysis is an interlock tie between a conventional firm and an Internet company in a year. For the tie formation analysis, the dependent variable is a dummy variable that equals 1 for a realized tie between a conventional firm and an Internet company. The sample includes all realized ties and 10 randomly selected conventional firm–Internet company ties that did not happen but were possible for each realized tie in a year.[12] Out of the 2,259 realized tie-years, 1,944 were actually used to include the lagged control variables (i.e., the number of interlock partners and the number of Internet partners in the previous year), and 19,727 out of 21,384 matched observations (1944×11) were actually included in the regression because of missing values.

For the tie dissolution analysis, the dependent variable is a dummy variable that equals 1 if a realized tie dissolved in a year. The sample includes all the realized ties between a conventional firm and an Internet company at the beginning of a year. Because the event of dissolution can only be observed for those realized ties, the seemingly unrelated bivariate probit model is computationally equivalent to a Heckman probit model, in which the tie formation analysis serves as the first-stage selection model. Moreover, I reported the Huber–White estimator of standard errors clustered by conventional partners to account for interdependence between observations.

The joint estimation results were reported in Online Appendices 2(a) and 2(b). The conditional SUNB model shows that media reports, the percentage of adopters within the same MSA, and the percentage of adopters within the same industry all have strong positive effects on the formation of ties but no significant effect on the dissolution of ties, consistent with the previously reported results of independent estimations. The likelihood ratio (LR) tests further confirm that the fashion variables have a stronger impact on tie formation than on tie dissolution ($\chi^2(1) = 4.04,\ p < 0.05$ for media reports; $\chi^2(1) = 6.28,\ p < 0.05$ for the industry peer effect; and $\chi^2(1) = 3.94,\ p < 0.05$ for the MSA peer effect). Similarly, the Heckman probit model shows that the percentages of firms within the same MSA and within the same industry both have strong positive effects on the formation of ties but no significant effect on the dissolution of ties. The LR tests further confirm that the two fashion variables have a stronger impact on tie formation than on tie dissolution ($\chi^2(1) = 18.93$, $p < 0.01$ for the industry peer effect; and $\chi^2(1) = 5.47$, $p < 0.05$ for the MSA peer effect). The fashion variable measured by media reports is omitted from the estimation because the proportional matching method precludes the variance at the year level. Together, the robustness of my results across different model specifications (negative binomial versus hazard rate), sample selections (full versus matched sample), and levels of analysis (firm versus dyad) provides especially rigorous support for the asymmetric effects of fashion variables on the formation and dissolution of ties.

Alternative Explanations

Despite the strong evidence supporting the attenuation effect of private information on social influence, there are a few alternative explanations. The first alternative explanation argues that firms that adopted Internet interlocks before the fad period might have had special structural reasons (other than learning) that prevented them from dropping Internet ties compared with firms that had not adopted such ties in the pre-fad period. First, the frailty-augmented piecewise exponential hazard model has already taken into account the unobserved heterogeneities at the firm level. In addition, the estimation of the variance of firm-specific heterogeneities rejects the hypothesis that some firms are more susceptible to tie failures than others after controlling for observables, further confirming that there is little unobserved heterogeneity in the conventional firm-specific hazards of tie failure. Besides the statistical correction, I also directly tested the argument that firms that established Internet interlocks before the fad were likely to retain their ties longer by creating dummy variables that indicate whether a tie's conventional partner had Internet interlocks before 1999 or 2000. If the special structure argument was true, then we should expect that Internet ties created by these firms in general survived longer, regardless of whether or not they were created during the fad period. However, the results show that neither of these variables is significant, again lending no support for this argument on unobserved structure.

The second alternative account explaining the lack of responsiveness of interlock dissolution to fashions involves a time-lag effect attributable to the appointment terms of directors. The typical term for an initial director appointment is three years; consequently, firms may not be able to immediately abandon the interlocks that were constructed in the previous one or two years. To test the potential time-lag effect, I lagged the three fashion variables by one, two, and three years, testing their respective impact on the dissolution of interlock ties. None of these variables generates a significant impact on the dissolution of networks, which helps rule out this alternative explanation attributed to director terms.

Finally, I conducted two sets of robustness checks regarding other forms of indirect learning. One has to do with the fact that fashion cycles per se may convey knowledge. Diverse information is conveyed when positive views during the boom period stand in contrast to pessimistic opinions during the bust era. In unreported analyses, I compared the sensitivity of network formation during the fashion cycle (1997–2003) with that of the post-fashion era (2004–2006) and found support for the fashion-cycle learning argument. The formation of Internet interlocks remains highly sensitive to all three fashion variables during the fashion cycle, but it is only sensitive to adoption within the same industry in the post-fashion era (2004–2006). The robust effect of peer actions within the same industry may be attributed to the fact that industry peers may be more likely to serve as a social comparison group because of the perceived relevance of their actions.

The second form of indirect learning may happen through relational connections such as trade. Firms that are in a close trade relationship with the Internet sector are likely to have more opportunities to obtain information about the Internet. In unreported analyses, I tested the moderation effects of trade on the formation and dissolution of networks. The results showed that, despite the absence of a significant attenuation effect on the formation of networks, a close trade relationship significantly reduces the failure hazard of ties that are founded in a hurry with peers within the same MSA area. Together, although evidence derived from these indirect forms of learning is weaker and noisier, it generally supports the argument that knowledge and learning facilitate independent decision making and reduce the influence of social conformity.

Discussion and Conclusion

In this study of the evolution of conventional firms' interlocks with Internet companies during the Internet bubble period, I have found that fashions had asymmetric effects on the formation and dissolution of networks. The popularity of network partners significantly increases the formation of networks with distant actors segregated by structural barriers but does not predict the dissolution of these ties. Building on the contact theory, I proposed that as direct contact affords opportunities for learning, it reduces a conventional firm's reliance on social information to judge the quality of network partners. As a result, the formation of distant networks is more sensitive to fashions than is their dissolution. Consistent with this argument, I further found that previous contact can prevent conventional firms from engaging in social adherence when forming networks. Those with direct contact were less likely to be induced by fashions to construct ties with popular network partners. Moreover, the ties they did form during the heyday of a fashion survived longer than those formed by other conventional firms without direct contact during the heyday of a fashion. These findings contribute to the literature in at least four respects.

First, this study expands the contextual perspective of network evolution. The contextual perspective provides a promising avenue for explaining how bridging ties across local sectors are formed. The promise of the contextual perspective rests on a change of environments that gives heterogeneous actors a chance to mingle (Sorenson and Stuart 2008). However, change also makes networks instable. Although scholars have shown that the change in social contexts can explain the formation of distant ties, they have not shown whether these ties will dissolve as soon as social contexts change again. It may not be surprising that networks gradually dissolve as the conditions that facilitate their formation and maintenance weaken or disappear. However, as long as the responsiveness of network formation to contextual factors is stronger than that of network dissolution, contextual factors should remain a powerful force that drives diverse actors together and shortens the distance between local clusters. One unique contribution of this paper is to show that the dissolution of networks is a much stickier process than their formation.

The contextual perspective also introduces a longitudinal and dynamic view of network evolution. Through taking into account macrocontextual factors, this paper answers the call of economic sociologists to embed organizational decisions into social contexts. Moreover, this paper brings a novel angle to the study of interorganizational networks and social contexts by treating network evolution as the subject of interests, thus departing from the tradition deriving from Granovetter (1985) that treats networks as antecedents of economic outcomes. Meanwhile, examining the attenuation effect of firm-level characteristics also answers the call of institutional theorists to attend not just to consensus and conformity but also to conflict and change in social structure (Scott 2004). Sorenson and Stuart (2008) focused on the main effects of fads and fashions in attracting distant organizations. This study extends Sorenson and Stuart by considering how individual organizations may respond

to fads and fashions differently. Firms' direct knowledge plays a critical role in attenuating the effectiveness of fashions as a driving force of network evolution. Incorporating organization-level heterogeneities helps to set up the boundary conditions of the theory of contextual factors as antecedents of network evolution.

Second, this study contributes to the network evolution literature by simultaneously examining network formation and dissolution. This study extends the literature to investigate the dissolution of networks and thus presents a more complete picture of network evolution. Moreover, the dissolution of networks itself is an understudied topic in the literature on network evolution. By showing that network formation and dissolution are driven by asymmetric forces, this study not only contributes to the need for investigations on the dissolution of networks but also suggests that the dissolution of networks is a more complicated process.

By highlighting the complicated nature of network dissolution, this paper also opens up promising avenues for future research. The core argument of this paper is that the absence of knowledge that leads to social conformity in the upswing of a fashion is overcome in the downswing of a fashion because of direct contact established through networking. Thus, independently of other forces, we should expect an asymmetric relationship between fashions and the formation and dissolution of networks. However, direct contact also opens up opportunities for various forms of social interaction. It is plausible to argue that certain effects of social interactions may prevent the dissolution of networks with low-quality partners and result in a stickier process of network dissolution (e.g., Sorenson and Waguespack 2006). However, this account is inadequate for explaining the observed asymmetry for at least three reasons. One is that the average life span of an interlock tie between a conventional firm and an Internet company during the period of my observation is 2.76 years, slightly shorter than the common 3-year term of appointment, suggesting that network dissolution is fairly frequent. Second, there is evidence suggesting that a network partner's quality (as is indicated for example by profitability) affects the hazard of tie failure. Third, the effects of social interactions alone cannot account for the variance in the process of tie dissolution, such as the moderation effect of direct contact in reducing the failure hazard of ties founded during fashion heydays. Future scholars should use interviews or surveys to examine the social and emotional processes associated with direct contact and to investigate how interlock networks may evolve with the interactions between directors and corporate management.

My finding that ties created by conventional organizations that have prior connection survived longer is consistent with the prediction of network matching theory that well-matched ties will be more stable (Vissa 2011). Using the dyad-level similarity and dissimilarity to predict the chance that two actors will be connected, the matching theory particularly emphasizes the criteria that organizations adopt to pick up network partners (Mitsuhashi and Greve 2009, Vissa 2011). The findings of this paper are consistent with the matching theory in three respects. First, the quality of matching is directly related to the quality of organizations' decisions in picking up network partners. Second, the finding that organizations abandoned fashion-induced ties confirms Vissa's (2011) point that organizational decision makers are only partially accurate in picking up networks partners. Third, the finding that direct connection transfers knowledge is also consistent with Mitsuhashi and Greve's (2009) finding that existing ties improve matching quality because the assessment of prospective partners requires private information that circulates only through direct connections. This paper also has two implications for the network matching theory: (1) the criterion of matching may not be static but changing and socially constructed, and (2) the criterion of matching may be extended from the level of dyads to micro–macro interaction. Future research that adopts the matching perspective can investigate how matching criteria evolve over time and how contextual factors may interact with dyad-level matching criteria.

Third, this study contributes to the organizational learning and interorganizational network literature. The number of papers that span the boundaries between learning theories and the interorganizational network literature has been growing. A key linkage between the two theoretical domains is the role of networks as a channel of learning (Powell 1990). Research has found that network-enabled learning ranges from straightforward imitation (e.g., Davis 1991, Haunschild 1993) to sophisticated inference (Beckman and Haunschild 2002). Recent research has reversed the order of reasoning, suggesting that organizations purposely build certain types of networks to discover new information and opportunities. Along this line of reasoning, Beckman et al. (2004) used the concept of exploitation and exploration in organizational learning theories to predict firms' networking behaviors in building new ties or reinforcing existing ones. Similarly, Baum et al. (2005) argued that organizations' learning from their past actions can explain their performance-driven network construction. My paper extends this literature by simultaneously treating direct networks as a source for acquiring valuable information and the construction and termination of networks as results of organizations' attempts to cope with uncertainties in their environment. Moreover, this paper suggests that the function of learning is not limited to refining organizations' skills or practices but also includes shielding them from external irrational exuberance.

In particular, this paper extends the contact theory by expanding the scope of application from individuals to

organizations. Decades of research on the contact theory have focused on how an individual's contact with out-group members reduces his or her intergroup prejudice. Early research on the contact theory mainly investigated how racial segregation and integration may change individuals' attitudes (e.g., Bradburn et al. 1971, Brooks 1975). Although recent studies have expanded the scope of investigation from racial groups to the homeless (Lee et al. 2004), homosexuals (Herek and Capitanio 1996), the mentally and physically disabled (Pettigrew and Tropp 2006), and even computer programmers (McGinnis 1990), most of these studies addressed the individual level. My findings that the behavior of organizations with direct contact is less affected by socially popular beliefs extend the contact theory to explain organization-level phenomena. In addition, future organizational scholars can profit from applying the contact theory to study the organizational-level phenomena by testing the conditions that facilitate integration and busting stereotypes.

Nevertheless, readers should be reminded that this study only considers one type of direct contact. In the current research setting, the limited scope of direct contact is less problematic because Internet companies belong to a new organizational population and thus other channels of connection may not have been highly developed. However, future researchers who apply the contact theory to account for other organizational phenomena should be aware of a full set of connection channels and consider the stage of development in interorganizational relationships.

Last, but not least, this study contributes to the interlock literature. Early scholars adopted resource dependence and class perspectives to study the formation of board interlocks (Borgatti and Foster 2003). They perceived interlocks as an instrument for managing organizations' resource dependence (Pfeffer 1972, Burt 1983, Mintz and Schwartz 1985, Mizruchi and Stearns 1994) and for maintaining the power and cohesion of capitalist elites (Domhoff 1967, Palmer 1983, Pennings 1980, Useem 1979). Since the 1990s, board interlock studies have adopted an information perspective and viewed directorate ties as an important channel for transferring information and sharing knowledge about effective organizational practices (e.g., Galaskiewicz and Wasserman 1989, Davis 1991, Haunschild 1993, Palmer et al. 1993, Beckman and Haunschild 2002). More recent interlock studies have also emphasized the constraints of geography on the formation of interlocks (Kono et al. 1998) and the imprinting effects of community structures (Marquis 2003). One implication of these interlock studies is that interlock networks tend to be stable (Beckman and Haunschild 2002, Sullivan et al. 2007) when interlock networks play an important role in maintaining elite cohesion (Useem 1984) or diffusing organizational practices (Davis 1991, Haunschild 1993) and when the development of networks is constrained by geographical boundary (Kono et al. 1998) or historical origins (Marquis 2003). However, this paper suggests that significant changes in interlock networks are possible. This paper adds to this vibrant body of literature by demonstrating that fads and fashions are yet another set of antecedents in the change of board interlocks.

Electronic Companion

An electronic companion to this paper is available as part of the online version that can be found at http://orgsci.journal.informs.org/.

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Endnotes

[1]The terms "fad" and "fashion" are used interchangeably in this paper.

[2]IRRC and ExecuComp also assign a unique ID for each director and executive. I identified unduplicated directors and executives using their IDs, names, ages, and gender.

[3]This definition of interlocks enables testing the formation of all three types of interlock: sent, received, and neutral interlocks. Haunschild and Beckman (1998) suggest that interlocks of all three types are influential channels of information and resources.

[4]There were 94 ties founded between 1996 and 2006 that were not counted as new ties because they emerged before both the partners first entered my sample.

[5]Fixed-effect models are often used to control firm-level unobserved heterogeneities but are inappropriate in the current context. Because the Internet companies are a new population and interlocks with conventional firms were relatively infrequent during the period of observation, most conventional firms did not initiate interlock ties with the Internet sector. These observations with an invariant dependent variable cannot contribute to the fixed-effect estimation and result in an 80% loss of the sample size. Nevertheless, the fixed-effect negative binomial and Poisson estimation results support the hypothesis that fashions have strong positive effects on the formation of interlocks with Internet companies.

[6]These periods were determined by considering both the typical director terms and the structure of my data. The most common director term is three years, and thus six years equals approximately two terms.

[7]The term α_i is assumed to follow a predetermined distribution with a fixed mean and variance θ. This paper adopts a commonly used gamma distribution but assuming the inverse Gaussian distribution produces similar results. The likelihood of the observed data can be derived by calculating the individual conditional likelihood and integrating out the frailty. Using the maximum likelihood algorithm, the regression parameters and frailty variance θ can be estimated.

[8]An alternate measure of the profit potential of an Internet company is the ratio of its market value over total assets. However, controlling for this variable would substantially reduce the sample size because of missing values in the market value data. Nevertheless, the reported results are not sensitive to controlling for the ratio of market value over total assets.

[9]I thank an anonymous reviewer for pointing this out to me.

[10]One exception is the bivariate probit model.

[11]The technical details of the estimation of the conditional SUNB model are available from the author upon request. In addition, Kim (2006) reported a GAUSS version of the unconditional SUNB estimation code.

[12]This approach of comparing actual ties with unrealized ones is same as that used in prior work on dyad-level analysis of tie formation (e.g., Sorenson and Stuart 2008, Mitsuhashi and Greve 2009, Vissa 2011). The use of a matched sample has advantages over the use of the full sample of all potential ties because the latter generates too many observations of a single firm in the data, which can lead to systematic underestimation of standard errors. Moreover, in this paper, the realized ties account for only 0.3% of all possible ties. The procedure of proportional matching does not reduce statistical power because rare events preserve most information, whereas the vast majority of the void potential ties are likely to be irrelevant controls. In addition to the 1:10 match, I also tried the 1:1, 1:3, and 1:5 matches, all of which produced similar results.

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