Exploring the evolution of supporter networks in the creation of new organizations

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ABSTRACT

Networks are important to entrepreneurial success. However, most research in this area to date has merely addressed the *what*; namely, what types of networks enable success. We seek to extend this stream of research by answering the *how* and the *why*. In so doing, we elaborate on *how* entrepreneurs can develop their networks, arguing that in order to create new organizations, nascent entrepreneurs must acquire resources from an increasingly diverse set of relatively stronger and weaker ties throughout the emergence phase. We then hypothesize *why* this evolutionary path is effective across the various dimensions of tie strength. Analyzing data from the Panel Study of Entrepreneurial Dynamics I (PSED I) with multilevel random coefficient growth curve modeling, we find strong support for our hypotheses. We conclude by discussing the implications of our findings for both academics and practitioners.

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1. Executive summary

Entrepreneurs must mobilize and deploy resources in order to successfully transform their ideas into new organizations. Unfortunately for entrepreneurs, because they tend to be resource-poor, they must, and often do, gain access to these resources from individuals external to the start-up effort. One conduit through which entrepreneurs access these resources is their networks of personal ties. The nature of the relationship between entrepreneurs and their personal ties is believed to influence both the functionality of the ties and the types of resources that can be accessed from them. While tie strength is one widely-accepted indicator of the quality of a relationship between two individuals, the nature of the effect is hotly debated. On the one hand, strong ties may confer social capital to the entrepreneur that is grounded in mutual trust among parties, which in turn, facilitates resource exchanges. However, due to the overlap between information already possessed by the focal actor and that provided by his or her strong ties, too much reliance on them may lead to redundancy. On the other hand, because weak ties exist among individuals with short-term, superficial relationships, they tend to connect individuals to more socially distant actors, thereby allowing access to a more diverse menu of resources than could be accessed by strong ties. Yet, at the same time, due to the arm's-length nature of these relationships, exchanges among weak ties may require the use of inefficient monitoring mechanisms. Given the benefits and costs of both strong and weak ties, many believe that successful entrepreneurs are those who leverage *both* types of ties.

While this assertion is not new, it merely addresses *what* types of entrepreneurial networks of ties are ultimately effective. Because only limited attention has been given to *how* and *why* these networks ought to evolve over time in entrepreneurial settings, we are left with a circumscribed understanding of them. In response, we examine *how* entrepreneurs' reliance on relatively stronger and

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weaker ties evolves throughout the emergence phase and *why* it ought to do so. We hypothesize that regardless of the composition of nascent entrepreneurs' supporter networks (i.e., networks of ties to individuals who have provided the organization with resources) at the onset of the emergence phase, unless their networking efforts connect them to an increasingly more heterogeneous set of supporters (in terms of the duration, multiplexity, frequency, and emotional intensity of their relationships to them), they are unlikely to obtain the set of resources necessary to transform their ideas into operational organizations.

The results of our study, which provide strong support for our hypotheses, may prove valuable to practicing entrepreneurs seeking to create new organizations. Broadly, our findings suggest that it is not where nascent entrepreneurs start but how they develop their networks over time that is important. In other words, nascent entrepreneurs who are overly reliant on relatively strong or relatively weak ties at any given time during the emergence phase can still succeed by leveraging ties to new supporters with whom they maintain relationships that are distinct from their pre-existing supporters. By increasing the heterogeneity of their supporter networks, nascent entrepreneurs can expand the menu of resources with which they can respond to the challenges inherent in the emergence phase. Thus, we encourage nascent entrepreneurs to be vigilant in their networking efforts throughout the emergence phase in order to be successful.

2. Introduction

Most nascent entrepreneurs, or individuals who initiate "serious activities that are intended to culminate in a viable business startup" (Aldrich, 2000: 77), must access resources from external sources in order to transform their ideas into viable organizations (Aldrich and Martinez, 2001). One way they can do this is by developing and leveraging relationships with resource gatekeepers (Johannisson, 2000); however, whether such efforts will actually result in an exchange of resources is a function of the quality of these relationships (Uzzi, 1996, 1999). While one important dimension by which the quality of relationships, or ties, can be is measured is their strength (Hoang and Antoncic, 2003), which types of ties – strong or weak – provide the best access to valuable resources is hotly debated (c.f. Coleman, 1988; Granovetter, 1973).

A good deal of theoretical and empirical work has explored the relationship between tie strength and various entrepreneurial outcomes, the results of which suggest that both strong and weak ties provide unique benefits to entrepreneurs and, thus, that each is likely necessary for success. While we agree in general with this position, most research in the area has focused on *what* types of networks are ultimately related to success. Very little of this research, however, has focused on the more complex issues of *how* and *why* entrepreneurs' reliance on strong and weak ties might have to evolve over time. One possible reason for the lack of attention to the *how* and *why* issues is that most prior studies of entrepreneurial networks rely on cross-sectional data (Jack, 2010; Ruef et al., 2003; Shane and Cable, 2002), generating static accounts of what is, in fact, a highly dynamic process (c.f. Greve and Salaff, 2003; Salancik, 1995; Steier and Greenwood, 2000). While such studies are informative regarding the relative proportion of strong and weak ties that correlate with various measures of entrepreneurial success at discrete points in time, they are largely silent with respect to how and why those proportions evolve over time. Despite continued calls for scholars to explore the evolution of entrepreneurial networks (Dacin et al., 1999; McEvily and Zaheer, 1999; Nicolau and Birley, 2003), "many questions concerning networks and how they develop over time [remain] under explored" (Jack, 2010).

Unfortunately, of the few studies that have addressed this *how* issue, most have focused on the context of established organizations (Burt, 1997; Guimerà et al., 2005; Uzzi and Spiro, 2005), leaving questions about network evolution in entrepreneurial situations unanswered. Of those scholars that have explored *how* entrepreneurial networks evolve, most have either arrived at the conclusion that entrepreneurs should rely only on one type of ties throughout the emergence process (Jack, 2005) or generated rather rigid models describing the manner in which entrepreneurial networks must evolve. Most notably, Hite and Hesterly (2001) contend that the composition of entrepreneurial networks will evolve from primarily strong ties during the emergence phase to an increasing proportion of weak ties throughout the growth phase. While we agree that nascent entrepreneurs' networks must become more *heterogeneous* (defined herein as a diverse mix of relatively stronger and weaker ties) over time, we disagree that this end state need not be realized until well-after the organization has emerged. Rather, we agree with prior scholars that diverse network ties are critical for emerging organizations (Ruef et al., 2003) and maintain that both strong and weak ties must be leveraged by nascent entrepreneurs in order for them to acquire the resources necessary for emergence. We also disagree that the development path of a heterogeneous network is unidirectional. On the contrary, because the starting points (Newbert, 2005) and resource needs (Evald et al., 2006; Greve, 1995) of nascent entrepreneurs are highly idiosyncratic, we believe that nascent entrepreneurs can develop their networks along a number of trajectories.

Finally, most studies in this area theorize about tie strength at a coarse-grained level (c.f. Patel and Terjesen, 2011) and "rarely obtain information on all dimensions of tie strength" (Jack, 2010: 128). Yet, by theorizing only broadly about the benefits that strong and/or weak ties *in general* might provide entrepreneurs, we know very little about precisely *why* strong and weak ties are important at a fine-grained level. In response, we develop hypotheses linking the individual dimensions of tie strength to entrepreneurial success.

In testing our hypotheses, we acknowledge that the majority of empirical work in this area has focused on existing organizations (Aldrich and Kim, 2007). The lack of research on organizations in the emergence phase, or the period of time between the genesis of an idea for and the actual creation of a viable organization (Lichtenstein et al., 2006), is important due to the fact that building resource-yielding relationships is such a time- and resource-intensive process (Birley et al., 1991). Given that nascent entrepreneurs face time and resource constraints that far exceed those of owners/managers of existing organizations (Aldrich, 2000), it is imperative that they engage in this process as efficiently as possible. We also acknowledge that networks are valuable to emerging organizations only to the extent that they enable nascent entrepreneurs to actually gain access to resources

(Ostgaard and Birley, 1994); thus, we restrict our focus to the nascent entrepreneur's network of "supporters," or those individuals from whom the entrepreneur actually acquires resources (Hanlon and Saunders, 2007). We measure the heterogeneity of these supporter networks as a composite measure reflecting the relative strength of each tie (at the time it was added to the network) in comparison to all other ties in the network. Analyzing data from the Panel Study of Entrepreneurial Dynamics I (PSED I) with multilevel random coefficient growth curve modeling, we find strong support for our hypotheses. Because these findings are consistent across multiple measures of tie strength and emergence, we believe that our results can contribute to the ongoing dialog about networks in entrepreneurial settings, with useful implications for both academics and practicing entrepreneurs.

3. Conceptual development

Given that nascent entrepreneurs tend to lack the resources necessary to transform their ideas into new organizations (Aldrich and Martinez, 2001), they must access resources from individuals external to the start-up effort (Garnsey, 1998; Hite and Hesterly, 2001; Stevenson et al., 1989). To this end, a nascent entrepreneur's personal network, or "the set of individuals to whom [he/she is] directly related" (Aldrich, 2000: 81), is essential as it extends the potential resource base of the entrepreneur (Aldrich and Zimmer, 1986). According to Uzzi (1996, 1999), the likelihood of an exchange of resources between two actors is a function of the quality of their relationship. One important dimension by which the quality of these relationships, or ties, is measured is their strength (Hoang and Antoncic, 2003).

3.1. Tie strength at the dyad level

The strength of a given tie is argued to be a "combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (Granovetter, 1973: 1361). Strong ties tend to be long-standing relationships based on affective and frequent contact (Elfring and Hulsink, 2003), and often exist among members of cohesive groups (i.e., families, friends) in which interaction is common and shared norms guide behavior that then manifests in a history of cooperative exchange (Coleman, 1988). In contrast, weak ties tend to be characterized as short-term, superficial relationships (Dubini and Aldrich, 1991) characterized by infrequent interaction and exchange (Granovetter, 1973).

The strength of ties is relevant to a discussion of entrepreneurs as it reflects his/her social capital (Coleman, 1988), which is a widely-accepted means by which actors can achieve desired ends by simultaneously broadening their access to resources and encouraging cooperation among those bound by the relationships (Adler and Kwon, 2002). As a result, "social capital is productive, making possible the achievement of certain ends that in its absence would not be possible" (Coleman, 1988: 98). According to Coleman (1988), the benefits an individual accrues from his/her social capital are maximized when it is built upon a network of strong ties. Because of the sense of mutual obligation and reciprocity among strong ties (Witt, 2004), they are highly motivated to assist one another (Adler and Kwon, 2002), leading to a higher likelihood of and greater efficiency in exchanges among them (Coleman, 1988). While Coleman (1988) does acknowledge that trade among weak ties is possible, he maintains that it is highly inefficient as it is only possible in the presence of expensive bonding mechanisms. Thus, Coleman (1988) ultimately concludes that networks of strong ties represent the most functional form of social capital. In support of this view, a good deal of empirical research suggests that strong ties are important to both resource mobilization and acquisition (Jarillo, 1989; Starr and Macmillan, 1990), particularly in the emergence phase (Greve and Salaff, 2003). Strong ties have also been found to be effective at providing access to a variety of specific resources in entrepreneurial settings including, but not limited to, social support (Birley, 1985; Brüderl and Preisendörfer, 1998; Greve, 1995), financial capital (Larson and Starr, 1993), and fine-grained and/or tacit information (Elfring and Hulsink, 2003; Hansen, 1995; Uzzi, 1997).

In contrast to Coleman's (1988) advocacy of strong ties, scholars such as Granovetter (1973) and Burt (1992, 1997) maintain that weak ties are the most functional sources of exchange. Unlike strong ties, which result in a substantial overlap between information already held by the focal actor and that possessed by his/her strong ties, weak ties connect the individual to more "socially distant" resources (Granovetter, 1973). Weak ties also act as bridges between otherwise disconnected networks, allowing for the introduction of new ideas and information from one network of individuals to another (Burt, 1992). Finally, weak ties are unencumbered by the types of social rigidities associated with strong ties that may complicate information transfer (Ahuja, 2000; Blyler and Coff, 2003). Because weak ties may allow access to a more diverse menu of resources than could be accessed by strong ties (Uzzi, 1999), they are believed to be particularly important sources of resources for entrepreneurs (Jenssen and Greve, 2002). In support, weak ties have been observed to provide entrepreneurs access to a variety of resources, including, but not limited to, financial capital (Jenssen and Koenig, 2002), novel ideas, knowledge, and information (Elfring and Hulsink, 2007; Gobbo and Olsson, 2010).

As this review highlights, strong and weak ties can facilitate the acquisition of different types of resources during the emergence phase. Given the substantial and idiosyncratic resource needs of nascent entrepreneurs, we argue that they will need to leverage both types of ties in order to secure the menu of resources necessary for the successful creation of their organizations. Moreover, because the samples examined in network studies are quite diverse, including but not limited to high-tech firms in the Netherlands (Elfring and Hulsink, 2003, 2007), growth-oriented firms (Jarillo, 1989), apparel firms (Uzzi, 1997), local small firms in the United States (Birley, 1985), new firms in Germany (Brüderl and Preisendörfer, 1998), participants in a start-up course in Norway (Greve, 1995; Jenssen and Koenig, 2002), as well as firms competing across multiple industries (Starr and Macmillan, 1990) and multiple countries (Greve and Salaff, 2003), it is clear that the benefits of strong and weak ties to entrepreneurial success span multiple contexts.

3.2. Tie strength heterogeneity at the network level

Given the advantages strong and weak ties can provide to entrepreneurs, it is perhaps not surprising that scholars have advocated that the most effective entrepreneurial networks are those composed of both types of ties (c.f., Dubini and Aldrich, 1991; Johannisson, 1988; Uzzi, 1996). While such advice is useful, it merely addresses *what* types of networks relate to success. Because most studies focus on the composition of networks at discrete points in time, they fail to address *how* networks ought to evolve over time to achieve an optimal structure. Among the few studies that have explored this issue, the process tends to be viewed as emanating from a specific starting point (i.e., all ties in the network are strong) and then proceeding along a predetermined path (i.e., weak ties are added throughout the growth phase) (Hite and Hesterly, 2001). While such a process could certainly prove effective for some entrepreneurs, it ignores the fact that individuals establish and leverage relationships for the purpose of obtaining benefits specific to the task at hand (Coleman, 1988).

In the context of emerging organizations, the "benefits" nascent entrepreneurs seek to obtain are a direct function of their immediate resource needs. Research shows not only that the emergence phase can be successfully undertaken from a variety of different starting points (Newbert, 2005), but also that the timing of key events, task priorities, and the subsequent resource needs of nascent entrepreneurs as they progress through that phase vary widely on a case-by-case basis (Katz, 1993; Reynolds and Miller, 1992). Thus, the emergence phase is characterized by tremendous variation in terms of not only what resources are needed, but also when they are needed. For this reason, Vissa (2011) argues that entrepreneurs are highly deliberate in their networking by targeting and leveraging those supporters who can provide them with the specific resources needed to complete tasks they presently face. Thus, nascent entrepreneurs leverage ties not based on convenience, but rather necessity. In this way, they are very strategic about their networking behavior (Hallen and Eisenhardt, 2012). Because the emergence phase is characterized by "trial and error …[with] no ready recipe to follow" (Johannisson, 1988: 86), nascent entrepreneurs' reliance on strong versus weak ties is likely to initiate and evolve in highly idiosyncratic ways (Evald et al., 2006).

Given this understanding, we believe that Hite and Hesterly's (2001) model is unlikely to describe the path taken by most entrepreneurs. Instead, we argue that a more accurate response to the *how* question posed above is that while nascent entrepreneurs must increase the heterogeneity of their supporter networks throughout the emergence phase such that they leverage ties to supporters with whom they maintain relatively weaker and stronger relationships, this increase need not occur in any particular direction. Due to their idiosyncratic resource positions and needs, nascent entrepreneurs can succeed in creating new organizations by adding relatively weaker ties to supporter networks composed of relatively stronger ties, adding relatively stronger ties to supporter networks composed of relatively weaker ties, or adding relatively stronger and weaker ties to supporter networks composed of relatively moderate ties. While our model allows for multiple paths to success, it also suggests a likely path to failure. By failing to diversify the types of ties they leverage, nascent entrepreneurs will homogenize their supporter networks over time and in turn limit their ability to acquire the resources critical to their organizations' success.

Fig. 1 illustrates how this process might unfold. In this example, two entrepreneurs initially acquire resources from three relatively weak and two relatively strong ties; thus, their supporter networks are identical at time 1. In each subsequent time period, however, these entrepreneurs leverage vastly different types of supporters, with Entrepreneur A acquiring resources only
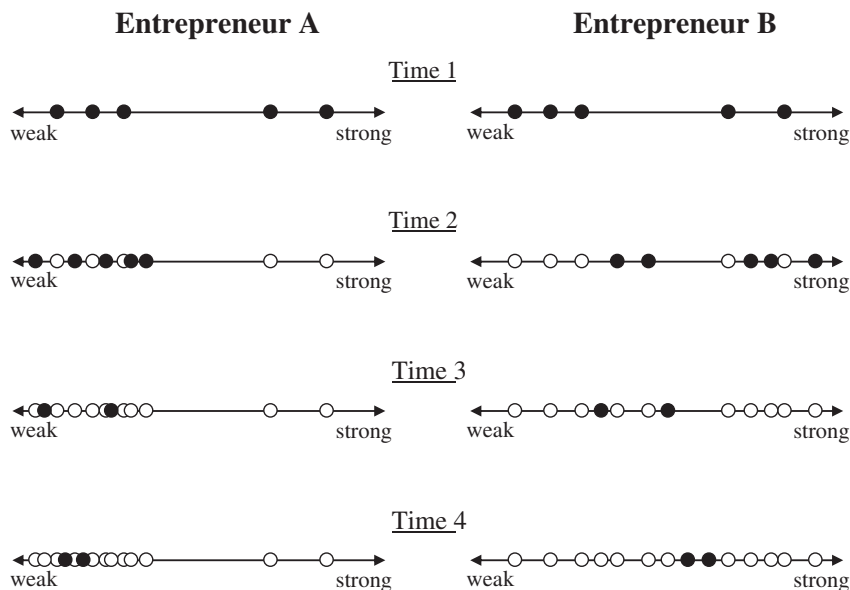
Fig. 1. Supporter network evolution over four time periods: Illustrative example.
Notes: Circles represent the strength of each tie to a supporter; shaded circles represent supporters added in current time period; white circles represent supporters added in previous time period(s).

from individuals with whom he/she maintains relatively weak ties and Entrepreneur B acquiring resources from individuals with whom he/she maintains a diverse mix of relatively weak, moderate, and strong ties. As a result, Entrepreneur A's supporter network becomes increasingly homogenous (i.e., most ties in the network are to supporters with whom he/she has similarly weak relationships) whereas Entrepreneur B's supporter network becomes increasingly heterogeneous (i.e., all ties in the network are evenly distributed along the weak–strong continuum such that he/she has a unique relationship with each supporter) over time.

In order to elaborate at a more fine-grained level *why* increasing supporter network heterogeneity is important for nascent entrepreneurs, we explore the underlying dimensions of tie strength as they relate to emergence. As noted above, tie strength is a "combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (Granovetter, 1973: 1361). Thus, we develop hypotheses below that seek to explain how increasing the heterogeneity of their supporter networks along these four dimensions – duration (i.e., amount of time), emotional intensity, frequency (i.e., mutual confiding), and multiplexity (i.e., reciprocal services) – can enable nascent entrepreneurs to acquire the resources necessary to create viable new organizations.

3.2.1. Duration of relationship and emergence

According to Uzzi (1999), relationships that are characterized by ongoing social attachments result in mutual trust. Trust is important to resource acquisition because it both mitigates the need to rely on cumbersome and costly legal and market mechanisms to govern exchanges, and infers an intention to execute them according to prior agreements (Nooteboom et al., 1996). In other words, individuals with long-standing ties tend to avoid jeopardizing the relationship by breaching the trust upon which it was founded (Brass et al., 1998; Vetlesen, 1994). For these reasons, the greater the duration of a tie between a nascent entrepreneur and a given resource gatekeeper, the more likely and efficient an exchange between the two should be.

However, the needs of organizations change over time (Hannan and Freeman, 1989) and the more rapid and sudden the changes they face, the less time nascent entrepreneurs will have to react. As such, there will likely be instances when nascent entrepreneurs must seek out and acquire resources from supporters with whom they do not maintain and/or with whom they do not have time to develop a long-standing relationship before the opportunity expires. Thus, successful nascent entrepreneurs will be those who are able to move beyond their pre-existing ties and establish ties to newly identified providers of critical resources (Hallen and Eisenhardt, 2012; Vissa, 2011). In this way, nascent entrepreneurs can be seen as strategic actors who must network instrumentally by identifying and then filling their resource needs by leveraging resource gatekeepers irrespective of the duration of their relationships to them.

In sum, while leveraging ties to individuals with whom nascent entrepreneurs have long-standing relationships can provide efficient access to resources, nascent entrepreneurs may often benefit from engaging in exchanges with individuals with whom they are largely unfamiliar. Thus, nascent entrepreneurs are unlikely to obtain all the resources they need by continuing to leverage ties to supporters with whom they maintain relationships of similar duration to those from whom they have previously acquired resources. Rather, successful nascent entrepreneurs are more likely to be those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals whom they have known for relatively longer and shorter periods of time.

Hypothesis 1. The more heterogeneous the duration of nascent entrepreneurs' relationships with their supporters throughout the emergence phase, the more likely their organizations will emerge.

3.2.2. Multiplexity of exchanges and emergence

Given the inherent uncertainty associated with their emerging organizations, search, due diligence, risk management, and other transaction-related costs are relatively high in exchanges with nascent entrepreneurs (Jones et al., 1997). Coupled with the fact that nascent entrepreneurs tend to lack the collateral to insure against the risk of default, they are generally perceived to be unattractive exchange partners (Suchman, 1995). Nevertheless, nascent entrepreneurs can mitigate these perceived risks by leveraging multiplex ties, or ties with whom an individual has previously engaged in exchanges (Holschuh and Segal, 2002). Because multiplex ties share a history of successful exchange, such supporters tend to ascribe the entrepreneur legitimacy on the basis of those exchanges and are generally more willing than those resource gatekeepers with whom the entrepreneur has not previously engaged in exchanges to continue to provide access to their resources (Larson and Starr, 1993).

The caveat of leveraging existing supporter ties is that when individuals engage in resource exchanges, asymmetric power imbalances are created (Emerson, 1962). Power imbalances have long been observed to confer bargaining power to suppliers, which if abused during negotiations, may result in inflated exchange prices (Porter, 1979; Tang and Tang, 2012). Thus, excessive reliance on multiplex ties may result in barriers to the exchange that nascent entrepreneurs, for whom financial resources tend to be scarce (Aldrich, 2000), cannot overcome.

In sum, while nascent entrepreneurs may find it necessary and beneficial to leverage ties to supporters with whom they have exchanged in the past, they would be wise to avoid relying on a small number of supporters for the majority of their resource needs so as to avoid excessive dependence on them. Thus, nascent entrepreneurs are unlikely to obtain all of the resources they need by continuing to leverage ties to supporters with whom they maintain exchange histories similar to those from whom they have previously acquired resources. Rather, successful nascent entrepreneurs are more likely to be those whose supporter

networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals with whom they share histories of exchange characterized by greater and lesser degrees of multiplexity.

Hypothesis 2. The more heterogeneous the multiplexity of nascent entrepreneurs' exchange histories with their supporters throughout the emergence phase, the more likely their organizations will emerge.

3.2.3. Frequency of interaction and emergence

By engaging in frequent interaction with potential supporters, nascent entrepreneurs can not only create emotional bonds that may facilitate trust, which as noted above may make exchanges more efficient, but also communicate their business ideas to them, thereby providing supporters with insight in regard to the challenges they are facing (Aldrich et al., 1987; Hallen and Eisenhardt, 2012; Hansen, 1995). Through this process, supporters develop positive affect and psychological attachment to the organizations as they are elevated from mere providers of resources to partners in their implementation (Vonk, 2002). By establishing a sense of commitment to the success of their emerging organizations in this way, nascent entrepreneurs may increase the likelihood of exchange.

Despite the incentives nascent entrepreneurs might have to leverage ties to resource gatekeepers based on frequent interaction, such relationships are inherently expensive and time consuming to develop and maintain (Granovetter, 1973; Uzzi, 1999). Because nascent entrepreneurs tend to lack slack time and financial capital (Aldrich, 2000), is it unlikely that they will be able to develop and maintain a large number of these types of ties. Moreover, due to the diversity of resources nascent entrepreneurs require in order to succeed in transforming their ideas into viable organizations (Aldrich and Martinez, 2001), it is likely that some resources (such as commodities) can be obtained via spot-market transactions for which repeated communication of the business idea is not necessary. Thus, nascent entrepreneurs will undoubtedly find it either necessary or simply more efficient to fulfill some of their resource needs by engaging in exchanges with supporters with whom they have not interacted frequently.

In light of the above arguments, it seems that while leveraging ties to individuals with whom nascent entrepreneurs interact frequently can encourage those individuals to provide access to their resources, reliance on such ties may not always represent the optimal strategy. Due to the diverse resource needs of emerging organizations, nascent entrepreneurs are unlikely to fulfill their resource need by leveraging ties to supporters with whom they interact with a frequency similar to those from whom they have previously acquired resources. Rather, successful nascent entrepreneurs are likely to be those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals with whom they have communicated with greater and lesser frequency.

Hypothesis 3. The more heterogeneous the frequency of nascent entrepreneurs' communication with their supporters throughout the emergence phase, the more likely their organizations will emerge.

3.2.4. Emotional intensity and emergence

Emotionally intense relationships typically exist in a tribal-like environment, characterized by shared norms, behaviors, and understanding (Granovetter, 1992). Not surprisingly, the most emotionally intense relationships tend to be among family members and friends (Granovetter, 1973; Witt, 2004). Because the presence of such peers strongly influences an individual's decision-making process (Zey-Ferrell et al., 1979), emotionally intense ties tend to behave in ways that will be perceived by others in the network as cooperative and mutually beneficial due to the fear of exile from the social group, thereby encouraging reciprocal behavior in the future (Provan, 1993). Thus, emotionally intense ties tend to provide access to their resources, often at below-market rates, due to an inherent sense of obligation to seek mutually beneficial terms of exchange (Witt, 2004). For these reasons, evidence suggests that nascent entrepreneurs will seek out individuals with whom they have a strong emotional attachment for various forms of support during the emergence phase (Renzulli et al., 2000; Ruef et al., 2003).

Despite the benefits that emotionally intense ties may provide to nascent entrepreneurs, the cohesiveness of such sets of individuals may mean that the menu of resources provided by them is likely to be highly redundant. According to Aldrich (2000: 82), "as ties to the same type of people accumulate, the marginal value of each succeeding tie drops." In other words, as ties to others within an individual's friendship circle increase, the more encapsulated that individual will be in terms of knowledge of the world (Granovetter, 1973), resulting in a "competence discount" (Ruef et al., 2003). In contrast, the resources available from unrelated ties are likely to increase the breadth of potential sources of opportunity to which the entrepreneur has access (Carruthers and Babb, 2000). For these reasons, many scholars advocate leveraging ties to individuals outside one's family and/or circle of friends so as to diversify the menu of resources to which the individual may gain access (Burt, 1992; Moore, 1990; Uzzi, 1999).

In sum, while leveraging emotionally intense ties can provide preferential access to resources, excessive reliance on them may reduce the diversity of those resources. Thus, nascent entrepreneurs are unlikely to maximize their ability to exploit the opportunities they face by continuing to leverage ties to supporters with whom they maintain relationships of similar emotional intensity compared to those from whom they have previously acquired resources. Rather, successful nascent entrepreneurs are more likely to be those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals with whom they share more and less emotionally intense relationships.

Hypothesis 4. The more heterogeneous the emotional intensity of nascent entrepreneurs' relationships with their supporters throughout the emergence phase, the more likely their organizations will emerge.

4. Methodology

4.1. Sample

The dataset used in this study is the Panel Study of Entrepreneurial Dynamics I (PSED I). The PSED I is a longitudinal dataset of individuals involved in the process of starting a business. These individuals were identified from a random digit dialing telephone survey of 64,622 adults in the United States between 1998 and 2000. From this target sample, nascent entrepreneurs, defined above as individuals who initiate "serious activities that are intended to culminate in a viable business startup" (Aldrich, 2000: 77), were identified. In order to be considered a nascent entrepreneur, the individual must have [1] been trying to start their own business (either for themselves or for their employer), [2] expected to be owners or part owners of the new firm [3] been active in trying to start the new firm within the previous twelve months [4] been still in the start-up or emergence phase and must not have been a new firm, and [5] be creating an organization that would not be majority owned by another business (Reynolds, 2000). From this process, 830 nascent entrepreneurs were identified with whom four comprehensive telephone interviews were then conducted at roughly yearly intervals in order to obtain ongoing information concerning the conditions surrounding their start-ups.

The fact that organizations were only included in the PSED I if they were currently in the emergence phase could result in some variance in the amount of networking undertaken by the nascent entrepreneurs in the sample by the time the initial data were collected. Therefore, cases were only included if they had started within a specific amount of time prior to the first interview. According to Yang and Aldrich (2012), the cutoff times used by most research in this area (i.e., 9 months, 24 months, etc.) are arbitrarily short and result in the exclusion of many relevant cases. We, therefore, follow Yang and Aldrich's (2012) lead and include all cases for which respondents had initiated start-up efforts within 120 months of the first interview, yielding a refined sample size of 748.

4.2. Measurement

4.2.1. Emergence
When considering what it means for a start-up to emerge, or become operational, recent research suggests that a start-up that is cash flow positive "has in some sense become qualitatively different than its component agents—it has taken on a 'life of its own'" (Lichtenstein et al., 2006). In other words, start-ups that achieve a positive cash flow are viable. Following Lichtenstein et al.'s (2006) lead, we operationalize emergence as a dummy variable, with cases assigned a value of one if they had become cash flow positive as of the final wave of data collection and zero otherwise.

Notwithstanding Lichtenstein et al.'s (2006) advocacy of this objective measure, it may not fully capture the viability of the new organization. For example, while a firm may be generating more cash than it spends, the manner in which it does so may not be sustainable. Thus, following prior research we also use a subjective measure of emergence that reflects the nascent entrepreneur's perception of the start-up, operationalizing it as a dummy variable, with cases assigned a value of one if the start-up is perceived to be an operating business as of the final wave of data collection and zero if it is perceived to be active but not operational, inactive, no longer being worked on, or something else (Carter et al., 1996).

4.2.2. Supporter network tie strength heterogeneity
During each wave of data collection, respondents were asked if there were any people that would not be on the start-up team that had provided any of the following resources: business services (such as legal, accounting, or clerical assistance), business training (training in business-related tasks or skills), financial resources (access to financial assistance, like equity, loans, or loan guarantees), ideas or creativity, information or advice, introductions to other people, labor, moral or emotional support, personal services (such as household help or childcare), physical resources (such as use of land, space, buildings or equipment), and/or other resources. We believe that these resources are relevant in a study of emerging organizations for two reasons. First, while some of these resources are common, most contribute directly to the organization's ability to create a competitive advantage and increase performance, by improving the efficiency and effectiveness of operations (business services, training in business related tasks or skills) and/or by facilitating the identification (creativity or ideas, information or advice, introductions to other people) or the exploitation (financial resources, labor, physical resources) of opportunities. The remaining resources contribute indirectly to the organization's success through the provision of the time (personal services) or encouragement (moral/emotional support) needed in order to execute the above operational activities. Second, although the relationship between some of these resources and the success of the start-up may appear spurious (i.e., personal services), in all cases the respondents indicated that the resources had been particularly helpful to their start-ups.

Nascent entrepreneurs who indicated having received these resources during the first wave of data collection were asked about their relationships with up to five of their supporters. During the subsequent waves of data collection, respondents were asked if they had received resources from any *new* supporters that were not identified during the previous interview waves. For those indicating that they had, information on the types of resources obtained and the entrepreneurs' relationships with these additional supporters was then collected for up to five supporters in wave two, another two supporters in wave three, and another two supporters in wave four. Although data on up to fourteen different supporters is available for each respondent over the four data collection periods, we exclude data on any supporters that were added to the network *after* the respondent

indicated having terminated the start-up effort or succeeded in creating an operating business. In so doing, we avoid biasing our subsequent analyses with data on networking activity that did not contribute directly to an organization's success or failure.

Because we seek to analyze the *evolution* of supporter networks, for a case to be valid it must have data points for at least two interview waves so that we can measure changes in these networks. Of the 748 respondents who had initiated start-up efforts within 120 months of the first interview, 346 indicated during at least two interviews prior to terminating start-up efforts or creating operating businesses that they had received resources from supporters. It is this set of 346 nascent entrepreneurs that constitutes our final sample.

Granovetter (1973: 1361) conceptualizes the strength of a tie as a "combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." He further suggests that these dimensions are best measured as continuous rather than dichotomous variables, which would result in measures reflecting the *relative strength* of a given tie rather than its classification as "strong" or "weak." Given this framing, we begin constructing our independent variables by measuring the relative strength of each tie between the entrepreneur and each of his/her supporters at the dyad level along the following four dimensions: duration (i.e., amount of time), emotional intensity, frequency (i.e., mutual confiding), and multiplexity (i.e., reciprocal services). We measure the strength of each tie at the time at which it was added to the network in order to capture the strength of the relationship required to obtain the resource in question; any further strengthening or weakening of the relationship beyond time would not be germane to this process and was, thus, not considered.

Duration refers to the length of time a relationship between two individuals has existed (Granovetter, 1973). We operationalize duration as the number of years the nascent entrepreneur had known the supporter. Frequency refers to how often two individuals interact with one another (Granovetter, 1973). We operationalize frequency as the number of times in the month prior to data collection the nascent entrepreneur had talked about business matters with the supporter. Multiplexity refers to "the overlap of different exchanges or activities in a social relationship. Thus, a multi-stranded or multiplex relationship is 'multipurpose' and contains more than one focus of interaction or content area" (Holschuh and Segal, 2002: 297). Relying on this conceptualization, Uzzi (1999) measures the multiplexity of the relationships between a small business and its financiers as the number of business services and personal services provided by the financier to the small business owner. Following Uzzi's (1999) lead, we operationalize multiplexity as the number of different resources the supporter provided the nascent entrepreneur. Emotional intensity is highest when individuals are members of cohesive groups such as families and friendship circles (Granovetter, 1973; Witt, 2004). The PSED I characterizes each relationship between an entrepreneur and his/her supporters as follows: spouse/partner, relative/family member, friend/acquaintance, business associate/work colleague, or teacher/counselor. We operationalize emotional intensity as a dummy variable with supporters who are spouses/partners, relatives/family members, or friends/acquaintances coded as one and supporters who are business associates/work colleagues or teachers/counselors coded as zero.

Because we ultimately seek to understand whether the strength characterizing the supporter network as a whole becomes more or less heterogeneous over time, we aggregate the above dyad-level data to the network-level by computing the Euclidean distance for each supporter network. A Euclidean distance function computes the square root of the sum of squares of the differences between the elements in a group and is, thus, a well-accepted measure of the overall degree of diversity among these elements (Sibley and Burch, 1979). For this reason, Euclidean distance functions are used regularly in management research when seeking to understand the overall degree of heterogeneity or homogeneity among the individuals comprising teams, work-groups, networks, and the like (Chen et al., 2007; Dose, 1999; Klein et al., 2004; Lavie and Rosenkopf, 2006). Thus, following Tsui et al. (1992), we employ the Euclidean distance function below, where *s* equals the tie strength (duration, frequency, multiplexity, or emotional intensity) of each of a given nascent entrepreneur's relationships with his/her *n* supporters, to operationalize our independent variables:

$$\sqrt{\frac{\sum_{j=1}^{n-1}\left(s_j - s_j\right)^2}{n}}.$$

We use this function to compute network-level heterogeneity values for each tie strength dimension (duration, frequency, multiplexity, and emotional intensity) and for each time period. Lower values for these measures indicate greater similarity in the strength of the ties between the nascent entrepreneur and his/her supporters, suggesting that the supporter network is composed of a relatively homogenous set of either primarily strong, primarily weak, or primarily moderate ties (i.e., Fig. 1, Entrepreneur A, time 4). Conversely, higher values for these measures indicate greater diversity in the strength of the ties between the nascent entrepreneur and his/her supporters, suggesting that the supporter network is composed of a relatively heterogeneous mix of strong and weak ties evenly distributed along the strong–weak continuum (i.e., Fig. 1, Entrepreneur B, time 4). By viewing how these values change over the four data collection periods in the PSED I, we are able to determine if the supporter network is becoming more homogenous over time (i.e., Fig. 1, Entrepreneur A, time 1 to time 4) or more heterogeneous (i.e., Fig. 1, Entrepreneur B, time 1 to time 4) for each tie strength dimension.

4.2.3. Control variables

In order to control for effects that might otherwise influence a nascent entrepreneur's ability to obtain resources and create a new organization, we control for the following market-, individual-, and organizational-level effects. We control for the

uncertainty of the market by including a dummy variable with a value of one for markets in which the product/service the organization seeks to offer is new to the market (specifically, if it was not available five years prior to the first interview) and a value of zero otherwise. We control for the number of supporters assisting the start-up as the number of individuals not on the start-up team who provided resources to the start-up effort at the time of the first interview. The natural log of this variable (plus one) was computed to normalize the distribution. We control for the organization's resource endowments as the number of resources provided by the start-up team and/or the respondent as of the first interview. We control for the type of start-up team as a set of dummy variables for solo and team start-ups, with spouse start-ups as the reference group. We control for the length of the emergence phase as of the initial interview, thereby reducing bias due to left-censoring (Yang and Aldrich, 2012), as the number of years from the time the nascent entrepreneur first conceived of the business idea until the first interview. We control for the respondent's vision for the start-up by including a dummy variable with a value of one for respondents who indicated wanting their new business to be as large as possible and a value of zero for respondents who indicated wanting their new business to be of a size they can manage themselves or with a few key employees. We control for gender as a dummy variable, with a value of one for female respondents and zero for male respondents. We control for race as a set of two dummy variables for white and "other" respondents, with black as the reference group. We control for age with a continuous variable indicating the age in years of the respondent. We control for the nascent entrepreneur's educational attainment by including a dummy variable with a value of one for respondents who indicated having obtained a minimum of a four-year college degree and zero otherwise. Finally, we control for prior start-up experience by including a dummy variable with a value of one for respondents who have previously started a new organization and zero otherwise.

5. Analysis

We begin our analyses by computing descriptives and correlation statistics for the model variables (see Table 1). These statistics, along with a visual inspection of the data, suggest that all variables are normally distributed. While the correlations among independent variables are low enough to dismiss concerns of multicollinearity, three correlations among control variables are notably high; namely, those between supporter resources, start-up team (solo), and start-up team (team), which range in magnitude from 0.643 to 0.746. However, the variance inflation factors (VIFs) for these correlations range from 1.705 to 2.255, well below the VIF of 10 that Kennedy (1992: 183) suggests is indicative of "harmful collinearity." Thus, the data is indeed assumed to lack the collinearity that might confound the results of any subsequent analyses.[3]

To test our hypotheses, we developed multilevel random coefficient growth curve models based on standard procedures (cf. Bliese and Ployhart, 2002; Bryk and Raudenbush, 1987; Chou et al., 1998; Singer, 1998) using the open-source computing environment R (version 2.7.0) and the Non-Linear and Mixed Effects models (NLME) package (Pinheiro and Bates, 2000). Growth models involve the consideration of whether entities (such as individuals, groups, or firms) change over time and whether there are differences in the patterns of change (Bliese and Ployhart, 2002). One example of this type of analysis in the entrepreneurship literature is Samuelsson and Davidsson (2009), who used latent growth modeling (LGM) to examine the Swedish counterpart to the PSED I. Using random coefficient modeling (RCM) to analyze longitudinal data is similar to LGM; however, LGM is based on structural equations modeling (e.g., Chan, 1998, 2002), while RCM is based on a regression framework (Bliese and Ployhart, 2002).

A main strength of longitudinal growth modeling in RCM is that it allows both intercept and slope to vary by individual. As a result, instead of a single regression line for each function, models in RCM allow a more customized fit for each individual in the dataset. This allows for extremely powerful predictions of both the initial value (intercept) and the change in value (slope) for each individual in the dataset. In generating these predictions, RCM is capable of handling correlated observations, missing data, and heterogeneity over time; moreover, it allows for the testing of predictors of change in longitudinal data (Bliese and Ployhart, 2002; Bryk and Raudenbush, 1987; Chan, 1998; Chou et al., 1998; Singer, 1998). In sum, RCM is an appropriate tool to test our hypotheses as it allows us to map out exactly what the change in the heterogeneity of the four dimensions of tie strength looked like over time for the entrepreneurs in the dataset so that we can determine if their supporter networks were becoming more or less heterogeneous over time. RCM also allows us to examine whether and how this change over time was different for individuals whose organizations had emerged compared to those that had not, while accounting for the potential impact of control variables.

In keeping with standard RCM procedure (Bliese and Ployhart, 2002), we began by converting the multivariate dataset (where each row contained complete data for each nascent entrepreneur) into a univariate, or stacked, form where each row represented one time period for each individual. Next, following standard coding procedures (Bliese and Ployhart, 2002), we included a time variable for each row in the dataset, which we coded 0, 1, 2, or 3 corresponding to the survey waves in the PSED I. Setting up the dataset in this manner nests individual responses during each time period within individuals, so the dataset reflects the multilevel nature of the responses.

We then followed Bliese and Ployhart's (2002) steps in order to build and test growth models. First, we built the Level 1 models, in order to identify whether the independent variables grow within each individual over time in a linear, quadratic, or cubic pattern, and whether the intercepts and slopes of this growth function vary by individual. The results of our Level 1 tests

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[3] As a check for robustness, the models described below were run without start-up team (solo) and start-up team (team), the results of which are identical in terms of the significance levels and patterns of relationships as those reported herein. The results of these tests are not reported herein but are available from the authors upon request.

Table 1
Descriptives and correlations.

	Mean	Std. dev.	N	1	2	3	4	5	6	7	8
1 Gender (female)	0.506	0.501	346								
2 Age	38.270	10.484	345	0.088							
3 Race (white)	0.650	0.479	341	0.029	0.225*						
4 Race (black)	0.080	0.275	341	−0.090	−0.151*	−0.403*					
5 Education	0.440	0.498	342	−0.058	0.142*	0.077	−0.073				
6 Length of gestation period	1.270	0.499	346	−0.030	0.180*	0.054	−0.050	−0.023			
7 Start-up experience	0.510	0.501	345	0.003	0.209*	−0.061	−0.045	0.047	0.037		
8 Number of supporters	1.440	0.483	330	−0.088	−0.006	−0.010	−0.049	0.055	−0.057	−0.016	
9 Market uncertainty	0.350	0.478	335	−0.127*	0.017	0.020	0.035	0.025	−0.007	0.037	0.059
10 Ambition	0.230	0.424	342	−0.186*	−0.103	−0.171*	0.085	−0.009	−0.056	0.006	0.116*
11 Supporter resources	4.671	7.156	346	−0.139*	−0.064	−0.120*	−0.030	0.000	−0.137*	−0.073	−0.011
12 Start-up team (solo)	0.560	0.497	333	0.139*	0.012	0.001	0.050	−0.027	0.103	0.097	0.084
13 Start-up team (team)	0.260	0.440	333	−0.146*	−0.110*	−0.106	0.017	0.105	−0.099	−0.055	−0.039
14 Duration	8.070	8.975	290	0.034	0.173*	−0.016	−0.094	0.069	0.028	0.001	0.208*
15 Multiplexity	1.295	1.037	315	−0.032	−0.010	−0.130*	−0.110	0.000	−0.067	0.076	0.394*
16 Frequency	8.877	10.100	314	0.021	−0.040	0.072	−0.066	0.054	−0.091	0.028	0.331*
17 Emotional intensity	0.278	0.409	316	−0.061	−0.021	−0.060	−0.063	0.036	0.048	0.059	0.336*
18 Cash flow positive	0.520	0.501	288	−0.057	0.154*	0.175*	−0.067	0.089	0.003	0.205*	0.096
19 Perception of emergence	0.430	0.502	301	−0.051	0.014	0.179*	−0.113	0.155*	−0.036	0.059	0.019

Note: Correlation coefficients for duration, multiplexity, frequency, and emotional intensity reflect values at time 1 only; correlations for other time periods are consistent with those reported herein.
* $p<0.05$.

showed that each of the dimensions of tie strength heterogeneity grew at what could be best described as a linear pattern and that each dimension's intercepts and slopes did vary by individual, allowing us to move forward with attempting to predict what differentiated the growth rates of nascent entrepreneurs along the dimensions of tie strength heterogeneity. Additionally, we included corrections for heteroscedasticity error in the duration, multiplexity, and emotional intensity models, and corrections for both autocorrelation and heteroscedasticity in the frequency model (Pinheiro and Bates, 2000).[4]

In accordance with standard RCM procedure (Bliese and Ployhart, 2002), we built our Level 2 models by creating an interaction term between the linear time variable and emergence (both cash flow positive and perception of emergence). In so doing, we reparameterized each measure of emergence by grand-mean centering so as to facilitate interpretation of the results (Bliese and Ployhart, 2002; Singer, 1998). We then included this interaction term, along with the control variables, in a series of Level 2 models designed to predict the slopes of the four dimensions of tie strength heterogeneity. Positive, significant parameter estimates for these interaction terms would suggest that nascent entrepreneurs who emerged not only increased the heterogeneity of the strength of their supporter networks, but also did so at a rate significantly greater than those who did not emerge.

6. Results

Tables 2 and 3 present the results of our Level 2 growth models.[5] Hypothesis 1 suggests that the more heterogeneous a nascent entrepreneur's supporter network becomes over time, in terms of the duration of his/her relationships with supporters, the more likely his/her organization will emerge. As Table 2 shows, the interaction term between emergence (operationalized as cash flow positive) and time did not predict slope differences in the heterogeneity of duration (estimate = 0.32; not significant). However, as Table 3 shows, the interaction term between perceptions of emergence and time did predict significant slope differences in duration heterogeneity (estimate = 1.25; $p<0.001$). When this interaction is plotted (Fig. 2), it is clear that nascent entrepreneurs who ultimately perceive their organizations as being operational are those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals whom they have known for relatively longer and shorter periods of time. In light of these findings, we conclude partial support for Hypothesis 1.

Hypothesis 2 suggests that the more heterogeneous a nascent entrepreneur's supporter network becomes over time, in terms of the multiplexity of his/her exchange histories with supporters, the more likely his/her organization will emerge. As Tables 2 and 3 show, the interaction terms in the multiplexity growth models were significant for emergence as measured by cash flow positive (estimate = 0.17; $p<0.01$) and perceptions of emergence (estimate = 0.20; $p<0.001$). The plots of these interactions show that successful nascent entrepreneurs exhibited significantly more positive slopes in multiplexity heterogeneity as compared to nascent entrepreneurs whose organizations did not emerge, whether defined in terms of the entrepreneur's

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[4] The full results of the Level 1 models are not included herein but are available from the authors upon request.
[5] As an additional check for robustness, we also ran our models on the full set of data in which organizations older than 120 month at the time of the first PSED I interview were included, the results of which are identical in terms of the significance levels and patterns of relationships as those reported herein. The results of these tests are not reported herein but are available from the authors upon request.

9	10	11	12	13	14	15	16	17	18
0.143*									
0.016	0.172*								
−0.033	−0.171*	−0.756*							
0.044 0.221*		0.643*	−0.669*						
−0.025	−0.100	−0.123*	0.137*	−0.074					
0.076	−0.011	0.107	0.056	−0.003	0.238*				
0.018	0.057	−0.052	0.111	−0.040	0.142*	0.146*			
0.007	−0.007	−0.175*	0.193*	−0.127*	0.153*	0.198*	0.185*		
0.017	−0.079	0.004	−0.009	0.015	0.031	0.041	−0.005	−0.031	
0.057	−0.005	0.068	−0.131*	0.144*	0.062	0.035	0.018	−0.004	0.476*

perception or positive cash flow (Fig. 2). Taken together, these findings suggest that nascent entrepreneurs who either perceived their organizations to be operational or attained positive cash flows are those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals with whom they share histories of exchange characterized by greater and lesser degrees of complexity. We therefore conclude support for Hypothesis 2.

Hypothesis 3 suggests the more heterogeneous a nascent entrepreneur's supporter network becomes over time, in terms of the frequency of his/her communication with supporters, the more likely his/her organization will emerge. The results in Tables 2 and 3 show that both interaction terms, cash flow positive∗time (estimate = 1.74; $p<0.001$) and perception of emergence∗time

Table 2
Level 2 growth models: cash flow positive.

Variable	Duration		Multiplexity		Frequency		Emotional intensity	
	Estimate	df	Estimate	df	Estimate	df	Estimate	df
(Intercept)	4.35	472	0.00	518	3.14	514	0.04	526
Firm	−0.01	223	0.00	243[†]	0.00	240	0.00	246
Gender (female)	0.28	223	−0.08	243	2.71	240[*]	−0.07	246
Age	0.11	223	0.01	243	−0.11	240	0.00	246
Race (white)	−4.73	223[**]	−0.40	243[**]	2.25	240	−0.11	246[†]
Race (black)	−3.51	223	−0.60	243[*]	1.36	240	−0.20	246[†]
Education	−0.28	223	−0.08	243	−0.05	240	0.03	246
Length of gestation period	−0.22	223	−0.02	243	−1.85	240	0.09	246[†]
Start-up experience	0.01	223	−0.16	243	2.37	240[†]	0.08	246
Number of supporters	4.91	223[**]	0.60	243[***]	5.57	240[***]	0.26	246[***]
Market uncertainty	−0.56	223	0.21	243[†]	−0.95	240	−0.02	246
Ambition	−1.34	223	−0.32	243[*]	1.50	240	−0.02	246
Supporter resources	−0.13	223	0.04	243[**]	0.00	240	−0.01	246[†]
Start-up team (solo)	0.05	223	0.48	243[*]	2.30	240	0.00	246
Start-up team (team)	1.09	223	−0.05	243	1.29	240	0.00	246
Cash flow positive	−1.21	223	0.10	243	−0.97	240	−0.06	246
Time (linear)	1.13	472[***]	0.20	518[***]	1.16	514[***]	0.03	526[***]
Cash flow positive∗Time (linear)	0.32	472	0.17	518[**]	1.74	514[***]	0.02	526[†]

N = 346.
Note: Because the control variables are measured at the level of the nascent entrepreneur and the Time (linear) is nested within each entrepreneur across multiple time periods, the degrees of freedom for the Time (linear) variable and any interactions associated with it (as well as the intercept) will always be greater than the degrees of freedom for the control variables.

[†] $p<0.10$.
[*] $p<0.05$.
[**] $p<0.01$.
[***] $p<0.001$.

Table 3
Level 2 growth models: Perception that firm is operational.

Variable	Duration		Multiplexity		Frequency		Emotional Intensity	
	Estimate	df	Estimate	df	Estimate	df	Estimate	df
(Intercept)	2.70	470	−0.14	518	−0.69	513	0.03	522
Firm	−0.01	230[†]	0.00	250	0.00	248	0.00	253
Gender (female)	−0.07	230	−0.01	250	2.27	248[†]	−0.05	253
Age	0.12	230[†]	0.00	250	−0.07	248	0.00	253
Race (white)	−4.30	230[**]	−0.31	250[*]	2.32	248[*]	−0.12	253[*]
Race (black)	−3.13	230	−0.55	250[*]	1.30	248	−0.22	253[*]
Education	0.15	230	−0.07	250	−0.13	248	0.04	253
Length of gestation period	−0.06	230	0.05	250	−1.37	248	0.05	253
Start-up experience	−0.29	230	−0.06	250	1.89	248	0.04	253
Number of supporters	4.42	230[**]	0.71	250[***]	7.32	248[***]	0.26	253[***]
Market uncertainty	−0.95	230	0.08	250	−0.13	248	−0.05	253
Ambition	−1.14	230	−0.36	250[*]	0.59	248	0.00	253
Supporter resources	−0.12	230	0.03	250[*]	−0.03	248	−0.01	253[†]
Start-up team (solo)	1.71	230	0.46	250[*]	2.14	248	0.06	253
Start-up team (team)	1.75	230	0.06	250	1.86	248	0.05	253
Perception	1.16	230	0.18	250[*]	−0.41	248	−0.01	253
Time (linear)	1.16	470[***]	0.20	518[***]	1.17	513[***]	0.03	522[***]
Perception∗Time (linear)	1.25	470[***]	0.24	518[***]	2.10	513[***]	0.04	522[***]

N = 346.
Note: Because the control variables are measured at the level of the nascent entrepreneur and the Time (linear) is nested within each entrepreneur across multiple time periods, the degrees of freedom for the Time (linear) variable and any interactions associated with it (as well as the intercept) will always be greater than the degrees of freedom for the control variables.
[†] $p < 0.10$.
[*] $p < 0.05$.
[**] $p < 0.01$.
[***] $p < 0.001$.

(estimate = 2.10; $p < 0.001$), were significant in the frequency growth models. Plots of these interactions show that only successful nascent entrepreneurs exhibited positive slopes in frequency heterogeneity regardless of how emergence was operationalized (Fig. 2). These findings suggest that nascent entrepreneurs who ultimately succeeded in creating new
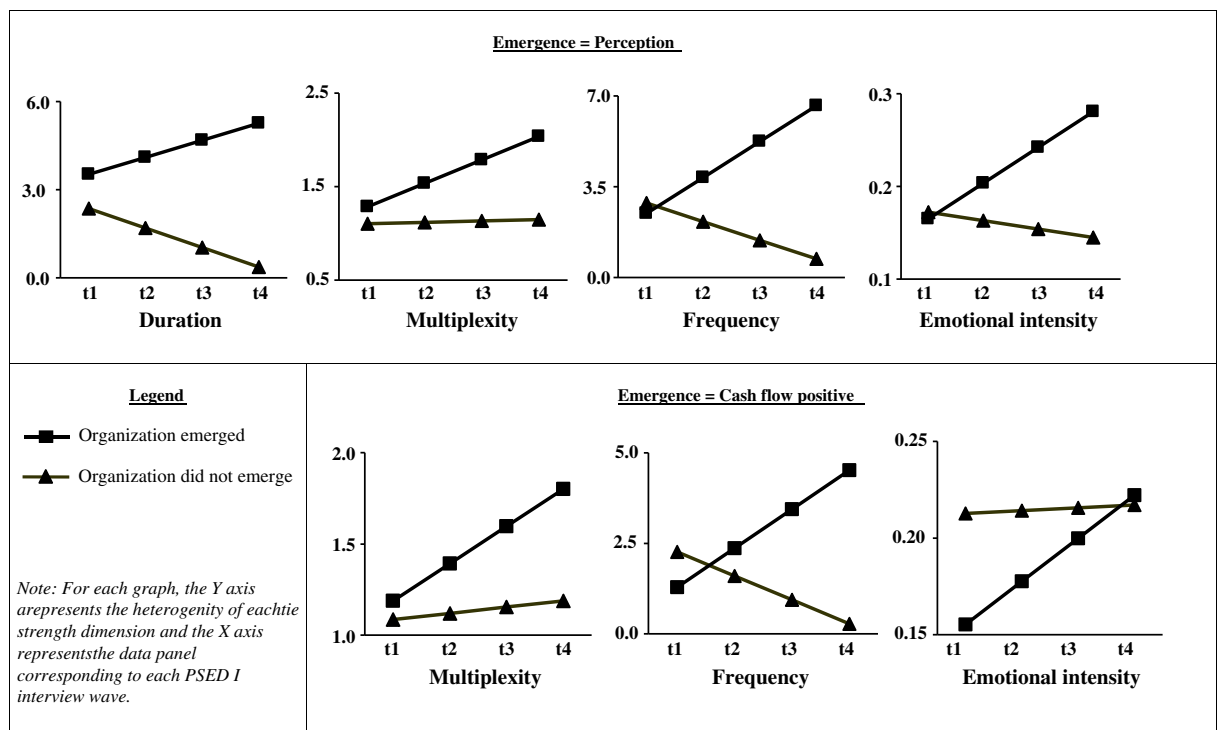
Fig. 2. Growth model results: heterogeneity of supporter network tie strength over time.

organizations (whether measured via perception of emergence or cash flows) are those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals with whom they have communicated with greater and lesser frequency, thereby supporting Hypothesis 3.

The final hypothesis suggests that the more heterogeneous a nascent entrepreneur's supporter network becomes over time, in terms of the emotional intensity of his/her relationships with supporters, the more likely his/her organization will emerge. The results of our emotional intensity growth models in Tables 2 and 3 suggest that the cash flow positive interaction (estimate = 0.02; $p<0.10$) and the perception of emergence interaction (estimate = 0.04; $p<0.001$) are significant. Fig. 2 depicts each of these interactions. The plot of the interaction between cash flow positive and time suggests that successful nascent entrepreneurs increased the heterogeneity of the emotional intensity characterizing their supporter network at a significantly greater rate than unsuccessful entrepreneurs. The plot of the interaction between perception of emergence and time clearly demonstrates that only successful nascent entrepreneurs developed supporter networks that became more heterogeneous in terms of emotional intensity over time. Taken together, these findings suggest that nascent entrepreneurs whose organizations ultimately became operational (whether measured objectively or subjectively) are those whose supporter networks become more heterogeneous over time such that they are ultimately composed of a diverse mix of individuals with whom they share more and less emotionally intense relationships. In light of these findings, we conclude support for Hypothesis 4.

7. Discussion

Our results suggest that the more heterogeneous the strength of a nascent entrepreneur's network of ties to supporters becomes over time, the more likely it is that his/her organization will emerge. Thus, it appears that acquiring resources from ties of *all* strengths (strong, weak, and in between) is critical to creating new organizations. The fact that this relationship was found to be significant across all dimensions of tie strength and for multiple measures of emergence provides strong support for our hypotheses. Notwithstanding this level of support, it is important to note that the nature of this relationship varied somewhat depending on the manner in which tie strength and emergence were operationalized. We discuss these nuances in detail below.

With regard to the duration of nascent entrepreneurs' ties to supporters, the results suggest that nascent entrepreneurs whose supporter networks become more heterogeneous throughout the emergence phase are more likely to be more successful at creating new organizations than those whose supporter networks become more homogenous. Thus, while nascent entrepreneurs who have long-standing relationships with most/all of their existing supporters at the onset of the emergence phase are likely to enjoy efficient resource exchanges due to the trust inherent in these relationships, such networks may not be sufficient at providing the full menu of resources necessary to respond to the rapidly changing opportunities entrepreneurs tend to face. In such cases, nascent entrepreneurs may find it essential to rather expediently obtain resources from supporters with whom they do not maintain and/or with whom they do not have time to develop long-standing relationships before those opportunities expire. This finding suggests a rather straightforward approach to networking; namely that when seeking to access resources for their emerging organizations, nascent entrepreneurs ought to seek out potential supporters whom they have known for very different lengths of time as compared to those supporters from whom they have previously obtained resources.

Interestingly, this same trend does not appear to hold for emerging organizations' cash flow positions. It seems that the supporter networks of nascent entrepreneurs whose organizations become cash flow positive do not evolve any differently over time, in terms of the duration of their relationships with supporters, than the supporter networks of nascent entrepreneurs whose organizations do not become cash flow positive. Of course, given that increasing the heterogeneity of ties along this dimension contributes to an entrepreneur's perception that the organization is operational, it may still be wise to increase the heterogeneity of ties along this dimension as doing so would not likely disadvantage the nascent entrepreneur.

With regard to multiplexity, we find that successful nascent entrepreneurs leverage ties to supporters from whom they have acquired an increasingly variable number of resources as they proceed through the emergence phase. This evidence suggests that the reduced transaction costs and increased legitimacy associated with supporters with whom nascent entrepreneurs have a history of exchange may enable the acquisition of the resources necessary for emergence. At the same time, however, this evidence suggests that such relationships may present power imbalances that can outweigh these benefits. Interestingly, it appears that although both successful and unsuccessful entrepreneurs may reap the benefits of increased heterogeneity, the rate of that increase is greater for successful than for unsuccessful nascent entrepreneurs. Unlike the results for duration, it may not be sufficient for nascent entrepreneurs with initially homogenous supporter networks to simply develop and leverage ties to new supporters with whom they share diverse histories of exchange. To the extent that nascent entrepreneurs are in competition with others for scarce resources, it appears that they must develop and leverage ties to new supporters earlier and/or more rapidly than rival entrepreneurs do in order to succeed.

With regard to frequency, our results suggest that the successful creation of new organizations requires that nascent entrepreneurs leverage ties to supporters with whom they have had an increasingly variable level of communication. Thus, it appears that successful nascent entrepreneurs have succeeded in obtaining resources that are best obtained when the provider feels a high level of attachment to the emerging organization as well as those that can be obtained via spot-market transactions. As such, homogenizing supporter networks by leveraging ties to supporters with whom entrepreneurs share a history of interaction similar to those from whom they have previously acquired resources seems to be, as is in the case of duration, a failing strategy. However, this is not to say that failure is imminent if one's supporter network is homogenous at a particular point in time. Rather, entrepreneurs should focus on leveraging ties to supporters in ways that continually increase the heterogeneity of their communications with new supporters over time. This finding supports our contention that theorizing about or empirically

examining the composition of networks at discrete points in time is not sufficient in order to understand entrepreneurial success. Because entrepreneurs spend a great deal of time and effort attracting resources (Bhide, 2000), a one-time view of their networks does not capture the dynamic ways in which they may evolve. As Nicolau and Birley (2003: 353) maintain, only "dynamic analyses of the evolution of entrepreneurial networks will generate critical insights into the genesis of firms."

Our findings for emotional intensity suggest that it is important for nascent entrepreneurs to leverage ties to supporters with whom they have an increasingly variable level of familiarity as they proceed through the emergence phase as such a strategy may allow for relatively easy and low-cost exchanges but, at the same time, avoid the redundancy inherent in their ties to supporters with whom they share strong emotional attachments. This is particularly important given that successful nascent entrepreneurs may (as in the case of frequency) occupy disadvantageous positions with regard to the heterogeneity of their ties to supporters as compared to unsuccessful nascent entrepreneurs early on in the emergence phase. Thus, successful nascent entrepreneurs are likely to be those who do not simply increase the heterogeneity of the emotional intensity of their ties, but rather do so at a rate greater than that of rival nascent entrepreneurs. As noted above, the fact that successful nascent entrepreneurs have more homogenous supporter networks early on in the emergence phase suggests that a dynamic view of networks is essential in understanding how they contribute to entrepreneurial success.

7.1. Implications

We believe that our findings can inform both theory and practice in important ways. From a theoretical perspective, the results of this study support widely held beliefs regarding the importance of both strong and weak ties in the acquisition of resources. Specifically, our findings suggest that strong ties may be more likely to provide access to resources due to the mutual obligation and reciprocity upon which they are built, thereby lending support to arguments that strong ties are a highly functional form of social capital (Adler and Kwon, 2002; Coleman, 1988). Our findings also suggest that weak ties are equally important to entrepreneurs. Indeed, it seems that due to their ability to connect entrepreneurs to more socially distant resource gatekeepers, weak ties may provide access to a more diverse profile of resources than strong ties (Burt, 1992, 1997; Granovetter, 1973). Given that strong and weak ties seem to provide complementary benefits to emerging organizations, our findings also stand in support of previous work in the area describing *what* types of networks (i.e., those that are comprised of both strong and weak ties) are most effective in entrepreneurial settings (c.f., Johannisson, 1988; Dubini and Aldrich, 1991; Uzzi, 1996).

At the same time, our study extends this literature by illustrating the importance of the strength of one's ties not as a static characteristic of the individual's network as it is typically operationalized in the empirical literature, but rather as a dynamic one. In so doing, it is one of a small number of studies to respond to calls by prior scholars to explore *how* networks must evolve over time so as to increase our understanding of the creation of new organizations (Dacin et al., 1999; McEvily and Zaheer, 1999; Nicolau and Birley, 2003). The result of this exploration both supports and challenges extant theory in the following ways.

Our findings support the argument that the value of a strong versus a weak tie is largely a function of the individual's resource needs, which are in turn a function of the task he/she is trying to accomplish (Adler and Kwon, 2002). Because the emergence phase can be successfully undertaken from different starting points and progress along distinctive paths (Newbert, 2005), it is likely that both strong and weak ties (as defined by their duration, multiplexity, frequency, and emotional intensity) will be called upon at various times and for various reasons during the emergence phase. As such, our findings challenge generalized arguments for the unidirectional evolution of entrepreneurial networks (i.e., Hite and Hesterly, 2001) and suggest that successful nascent entrepreneurs must grow their supporter networks in highly deliberate and strategic ways throughout the emergence phase based on their organizations' idiosyncratic resource needs (Vissa, 2011). Such a conclusion is consistent with recent work in the area that has argued in favor of entrepreneurs' behaviors, as opposed to traits, as critical to organizational emergence (c.f., Delmar and Shane, 2004a, 2004b; Tornikoski and Newbert, 2007).

In addition to answering the question of *how* entrepreneurs' reliance on strong and weak ties evolves over time, our study also answers the question of *why*. Whereas most studies in this area theorize about the effect of tie strength in general on entrepreneurial success, we theorize more deeply about the benefits that strong and weak ties can provide entrepreneurs across a number of dimensions of tie strength and develop a number of fine-grained hypotheses linking these dimensions to emergence. Because we find support for each of these hypotheses, our study extends the knowledge gained from prior studies by explaining precisely *why* strong and weak ties are important to nascent entrepreneurs.

Due to the relatively small body of research that considers the role networks play in the founding of new organizations (Aldrich and Kim, 2007), "how individuals create new firms remains one of the least understood features of modern societies" (Reynolds and White, 1997: 39). By conducting this study within the context of emerging organizations, we believe that it can contribute to the literature on entrepreneurial networks by providing insight into the role networks and networking play in the emergence phase. Given that emerging organizations face resource constraints that far exceed those of owners and managers of existing organizations (Aldrich, 2000) and are generally perceived to be unattractive exchange partners (Suchman, 1995), we believe that evidence suggesting how nascent entrepreneurs can ultimately succeed in creating new organizations despite these liabilities to be of considerable interest to entrepreneurship scholars.

Finally, this study is one of the few studies in strategy or entrepreneurship to employ growth modeling as a way to model change over time (see Samuelsson and Davidsson, 2009 for a noteworthy exception). Despite the fact that organization scholars are often interested in the examination of phenomena that are temporal in nature (c.f., George and Jones, 2000; Mitchell and James, 2001), most research in this area is based solely on cross-sectional designs. While random coefficient modeling and latent growth curve modeling have been introduced in the broader management literature to enhance our understanding of the ways in

which variables develop over time (e.g., Bliese and Ployhart, 2002; Chan, 1998, 2002), these methodologies still have a great deal of potential to add to our understanding of the ways in which organizations themselves evolve. Thus, we agree with Dacin et al. (1999) that for network research to move forward, it must be conducted with alternative methodologies that capture its temporal characteristics, and we hope to have provided an example of one way in which to do so.

From a practical perspective, our finding that the more heterogeneous the strength of nascent entrepreneurs' ties to their supporters become over time the more likely their organizations are to emerge ought to be of great interest to individuals involved in the process of creating new organizations. While theory suggests that the static characteristics of one's existing relationships may play an important role in the emergence phase, our results show that nascent entrepreneurs who lack a mix of strong and weak ties at the onset of the emergence phase may still succeed in creating viable organizations. In other words, because strong and weak ties each provide distinct, yet complementary, benefits to emerging organizations, nascent entrepreneurs would be wise to develop and leverage ties to supporters with varying degrees of strength in order to capitalize on those benefits.

Therefore, nascent entrepreneurs ought not be overly concerned if their supporter networks exhibit a high degree of homogeneity early on in the emergence phase. As our findings suggest, success in the emergence phase is not a function of where nascent entrepreneurs start, but more importantly the journey they take as they develop ties with supporters. Although the strength of the ties between nascent entrepreneurs and their supporters is widely cited as an important predictor of success, our findings suggest that a static view of tie strength provides an incomplete lens with which to view this phenomenon. As long as they are willing and able to network with supporters in strategic ways over time, success may well be attainable for all nascent entrepreneurs. As such, we encourage nascent entrepreneurs, regardless of the status of their ties to supporters at any given point in time, to seek out potential supporters actively and deliberately throughout the emergence phase. However, when doing so, nascent entrepreneurs must be aware of the competition for scarce resources and outpace their rivals in the pursuit of potential supporters. In sum, entrepreneurs ought to take comfort in the notion that success in the start-up process is not necessarily a function of their pre-existing ties at the onset of the emergence phase, but more importantly of their efforts once they initiate it.

7.2. Limitations and conclusions

While we believe that the present study may contribute to what is known about networks in the emergence phase, we identify the following limitations of the present study and offer advice for scholars interested in this line of research to improve upon it in future research. Regarding our operationalization of nascent entrepreneurs' networks, we focus squarely on the set of individuals that actually provide resources to the emerging organization, or what Hanlon and Saunders (2007) refer to as "supporters." In so doing, we follow the guidance of Barnes (1969), who argues that it is not the entirety of an entrepreneur's ties that is important in the emergence phase, but rather the subset of individuals who are actually involved in the conditions surrounding its founding. More importantly, by employing this approach, we believe we have provided more relevant theorizing and more actionable advice to practicing entrepreneurs regarding the types of individuals with whom they ought to form relationships than had we focused on additional individuals to whom the nascent entrepreneurs were related but who did not contribute to their emerging organizations. Nevertheless, we acknowledge that this methodological choice has resulted in a circumscribed view of a nascent entrepreneur's entire set of personal ties and advise scholars interested in testing the relationships proposed herein on fully-specified networks to examine these dynamics in future studies.

In defining supporter networks in this way we have intended to capture the breadth of resources obtained from each supporter. However, the PSED I only includes data on resources provided in order to facilitate the emergence of the organization. Thus, we are unable to examine resources that supporters may have provided to the nascent entrepreneur that did not pertain to the start-up, which may in some cases fail to capture the full strength of the ties. Although capturing non-business-related transactions was not central to our research agenda, we advise readers to accept our results guardedly to the degree that any slippage in the measurement of this construct is present. As a related point, it is possible that an entrepreneur's supporter network may consist of various sub-networks that may be called upon for the execution of specific tasks. Given that identifying such sub-networks is not possible with the PSED I, a worthy research agenda for interested scholars would involve identifying and differentiating any sub-networks by function and then examining how they contribute to emergence.

Regarding our research question, we have purposely chosen to examine how the strength of supporter networks *as a whole* evolves over time. While recent empirical work has explored tie development as a function of the frequency of communication (Hallen and Eisenhardt, 2012), we know of no other studies that have explored whether and how the strengthening or weakening of the individual ties over time across the full spectrum of tie strength dimensions might also contribute to emergence. While we view our ability to examine this phenomenon as a strength of our study, we at the same time recognize that our analysis does not, for some of the entrepreneurs in the PSED I, capture the entire emergence phase. While we employed various controls to address the issue of censoring inherent in the dataset, we were nevertheless only able to measure changes to entrepreneurs' supporter networks at four annual intervals, which allows us to examine only three changes over that time period. Not only does this render our view of the emergence phase somewhat circumscribed in some cases, but it also inhibits our ability to determine the relative importance of resources obtained from supporters within the same year to the emerging organizations' cash flow positions and/or the entrepreneurs' perceptions. Thus, while we believe our methodological approach to be an improvement over previous static analyses, we acknowledge that the window through which we can draw conclusions is limited and, therefore, encourage interested scholars to extend the present study by analyzing network evolution over longer time intervals in future research.

Regarding our findings, while we believe our results that successful nascent entrepreneurs increase the heterogeneity of the strength of their supporter networks throughout the emergence phase are compelling and important, we acknowledge that they reflect what successful nascent entrepreneurs *in general* do. Although RCM accounts for the intra-individual patterns of change over time in computing the parameter estimates (a significant advantage over more traditional statistical methods), we are nevertheless unable to determine how the supporter networks of *individual* nascent entrepreneurs change over time. Thus, scholarship examining how this phenomenon unfolds at the individual level would complement the present research.

Regarding the implications of our study, while we believe that the sampling procedure and empirical analyses have been conducted rigorously and have generated compelling findings with regard to supporter networks, we acknowledge that they are nevertheless only generalizable to nascent entrepreneurs in the United States given the sampling procedure used by the PSED I architects. Whether the present findings are predictive of entrepreneurial behavior in other contexts cannot be confirmed. As such, we encourage scholars interested in this line of inquiry to test the model using data from other geographic regions.

While the above suggestions for future research in response to the data limitations of the PSED I may extend the findings of the present study in valuable ways, it is important to place this and all studies using the PSED I and its successor, the PSED II, in the proper light. Given the widely accepted challenges of obtaining quantitative data about organizations before they actually exist (i.e., before an organization becomes operational, there is no organization from which to access data), studies of emerging organizations are inherently challenging from a data perspective (Bamford et al., 2000). And, while the PSED I and PSED II do have their limitations, they are arguably the best large-scale data collection efforts that have yet been conducted on nascent entrepreneurs in the United States. Thus, rigorous empirical analyses of the PSED I and PSED II, while perhaps not as comprehensive as we might like, nevertheless provide us with some of the richest insights yet into the workings of emerging organizations.

Notwithstanding the above limitations, we believe that our findings can inform the collective understanding of the interplay between tie strength and organizational emergence. Given the importance of the emergence phase, coupled with the lack of attention given to it in the empirical literature, we believe that our study is both timely and important. Moreover, our use of longitudinal modeling techniques represents a more comprehensive and rigorous approach than has been the norm in prior studies in this area. As a result, we believe that our empirical results, which stand in strong support of our hypotheses, have important implications for both academics and practitioners. At the very least, we hope to have added richness to the ongoing discussion regarding the importance of tie strength within the context of emerging organizations.

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