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Network to passion or passion to network? Disentangling entrepreneurial passion selection and contagion effects among peers and teams in a startup accelerator

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ABSTRACT

Entrepreneurial passion is socially contagious. However, do entrepreneurs also select whom they interact with based on passion similarity? The complex interdependencies between social networks and entrepreneurial passion remain undertheorized and empirically puzzling. Using a stochastic actor-oriented model (SIENA) and four waves of panel data, we test hypotheses about the co-evolution of social networks and entrepreneurial passion during a 5-month startup accelerator program. We observe that social ties occur more frequently among peer entrepreneurs who are similar in levels of passion for founding. Initial homophily selection explains 34% of this observed similarity whereas social contagion explains 57%. Finally, we find that passion for founding is more contagious among members of startup teams than across other peer ties. Surprisingly, none of these effects are significant for passion for inventing. We discuss the theoretical and practical implications of these findings.

1. Executive summary

Entrepreneurial passion plays a crucial role in driving performance. Passion research has been growing, with an increasing number of studies investigating how passion affects not only entrepreneurs themselves but also those they are connected to including co-founders, startup employees, and investors. The consensus of this strand of literature is that passion is contagious and can spill over to others. Thus, when two connected individuals share entrepreneurial passion, it is reasonable to assume that this similarity is due to contagion processes. However, networks may not be pre-established, and it is possible that passionate individuals attracted and selected others who shared their passion from the outset. This raises questions about the extent to which initial selection versus social contagion explains the similarity among connected individuals. Therefore, we focus our investigation of entrepreneurial passion on disentangling selection from contagion.

We study 89 entrepreneurs going through an early-stage accelerator programs from signup to Demoday. Using a four-wave panel study, we measure entrepreneurs' passion for founding and inventing, as well as their social network connections with peer entrepreneurs in the same program cohort. To understand the complex interplay of changes in both the entrepreneurial peer network structure and the passion of the entrepreneurs forming these networks, we use SIENA. SIENA is an actor-oriented statistical model for

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studying the co-evolution of networks and individual actor characteristics. First, we find that entrepreneurs connect to peer entrepreneurs based on similarity in passion for founding. Second, controling for this homophily selection effect as well as network structure, we find that passion for founding is contagious. Through decomposing network autocorrelation, we show that initial homophily selection explains 34% of this observed similarity whereas social contagion explains 57%. Moreover, the passion contagion effect is stronger among co-founders than among other peer relationships. Finally, we find that these relationships are significant for passion for founding, but not passion for inventing.

Our central finding that initial homophily selection explains a good portion of passion similarity in connected entrepreneurs, even when accounting for contagion processes, contributes to the literature in several ways. First, if passion for founding can also be selected upon, an exclusive focus on contagion processes can be misleading and observed effects of contagion on passion similarity might be inflated. Second, our study contributes to the literature on peer entrepreneurship and startup team formation, showing that accelerator peers and especially co-founders are an important source of passion for founding. More practically, our findings suggest that entrepreneurs should exercise caution when selecting new members to join their startup team. While entrepreneurs high in passion for founding can become an asset to infect others with their enthusiasm and energy, entrepreneurs high in passion for inventing would need to be selected. Finally, our findings also have implications for entrepreneurship programs, such as accelerators, which can leverage social events like weekly dinners and guest speakers to cultivate passion for founding at the cohort level.

2. Introduction

Empirical evidence is mounting that entrepreneurial passion—intense positive feelings for specific entrepreneurial role identities—is not only an important predictor of individual, team, and venture level outcomes (Boone et al., 2020; Cardon and Kirk, 2015; Santos and Cardon, 2019), but that it is also socially contagious: passion can transfer from one person to another (Cardon, 2008). For instance, entrepreneurs can transmit their passion to employees (Hubner et al., 2020) as well as investors (Davis et al., 2017), and members of a new venture team can experience passion convergence over time (Uy et al., 2021). Taken together, these studies advance a more socially embedded conceptualization of passion and effectively challenge earlier views of passion as a static intraindividual construct (Cardon et al., 2013; Murnieks et al., 2020).

As scholars show more interest in how patterns of social relationships are central to our understanding of entrepreneurial passion, there is a need to recognize that these patterns can also be represented and modeled by social networks—sets of actors linked with sets of ties that, together, yield a particular social structure (Borgatti and Halgin, 2011). To date, the interdependencies between entrepreneurs' social networks and their passion not only remain undertheorized, the relevant studies also lack the methodological tools with which these interdependencies can be empirically examined (Steglich et al., 2010; Snijders et al., 2010). For instance, that passion converges among team members on a new venture tells us something about the capacity of social networks (e.g., teams) to shape entrepreneurial passion, but it reveals nothing about how passion might have shaped the development of these networks to begin with (e.g., similarly passionate entrepreneurs select into the same team). This tendency to seek the company of like-minded others—known as homophily selection—is one of the most robustly documented social phenomena (Ertug et al., 2022; Lawrence and Shah, 2020). Even if such co-evolutionary processes were to be considered theoretically, the analytical tools commonly used in studies of passion are not specifically designed to disentangle homophily selection from social contagion effects.[1]

Clearly, social dynamics are extremely relevant to investigations of both homophily selection and social contagion (Knight et al., 2019; Lazar et al., 2020). Beyond their fellow co-founders, entrepreneurs also interact with peers who are members of founder networks (Collewaert et al., 2016; de Mol et al., 2020); peers in parallel industries (Zuckerman and Sgourev, 2006); in entrepreneurship training programs (Gielnik et al., 2017); startup competitions (Boone et al., 2020; Foo et al., 2005); and startup accelerators (Cohen et al., 2019). To the extent that other entrepreneurs are a valuable source of information, knowledge, resources, and motivation (e.g., Cai and Szeidl, 2018; Eesley and Wang, 2017; Lerner and Malmendier, 2013), they are also likely to play a vital role in how entrepreneurial passion is developed and manifested. Overall, the study of passion as a socially embedded dynamic construct is currently missing a social network perspective.

To fill this gap, we investigate the co-evolution of entrepreneurial passion and peer networks. We use homophily theory and social contagion theory to hypothesize that entrepreneurs select similarly passionate others as network ties, and that once ties have been established, that passion exerts a social influence—or contagion—effect. To test these hypotheses, we use four waves of data collected from a cohort of 89 entrepreneurs (nested in 33 startup teams) who participated in a university-based accelerator program (e.g., Gielnik et al., 2015; Kaandorp et al., 2020). Using this longitudinal panel data and Simulation Investigation for Empirical Network Analysis (SIENA) (Snijders, 2001), we find that entrepreneurs initially tend to initiate new ties with people who share a similar passion for founding new ventures. Once network ties have formed, high levels of passion become infectious, especially within startup teams where peer ties are stronger and interactions more frequent. While initial selection explains about 34% of passion similarity in connected peer entrepreneurs, contagion explains 57%. Surprisingly, the same effects do not appear when it comes to passion for inventing.

[1] Prior studies have used aggregated mean and diversity scores (de Mol et al., 2020; Santos and Cardon, 2019); random coefficient modeling (repeated measure designs with lagged predictors; Lex et al., 2020); latent growth modeling (intraindividual differences in interindividual passion change over time; Collewaert et al., 2016); consensus emergence modeling (change in residual variance within groups; Uy et al., 2021). While offering some advantages (e.g., the ability to capture passion fluctuations over time), none of these methods adequately account for social network features and passion dynamics simultaneously.

This study makes important contributions to entrepreneurial passion theory and to studies of entrepreneurial peer networks and research on startup teams. We contribute to research recognizing that entrepreneurial passion is an important emotion with inter-individual effects (Murnieks et al., 2020). In particular, our framework and findings challenge prior work (e.g., Hubner et al., 2020; Uy et al., 2021) that has glossed over the selection mechanism linking entrepreneurial passion and social network ties, and that has only considered one-way contagion effects (e.g., how entrepreneurs' network ties influence the emergence of entrepreneurial passion but not the other way around). In light of the present study, prior work may have substantially misrepresented how entrepreneurial peer networks and passion coevolve. In providing a more complete conceptualization and an empirical examination of this relationship, we enable deeper insights about passion as a socially embedded construct.

Additionally, our focus on peer entrepreneurs extends prior research on passion contagion beyond its current focus on investors (Davis et al., 2017; Murnieks et al., 2016), employees (Breugst et al., 2012; Hubner et al., 2020), or even the subset of peers that together form the co-founding team (Uy et al., 2021). Since we are able to capture the social processes that drive entrepreneurial passion among peers, both outside and within team boundaries, we respond to calls for a better understanding of "how a team member's entrepreneurial passion influences his or her teammates' passion" (Patzelt et al., 2020: 11). Similarly, we draw on passion theory and advances in social network analysis to show how team formation is endogenous, demanding more attention to selection processes (Lazar et al., 2020).

3. Theory and hypotheses

3.1. A network perspective on entrepreneurial passion

In this paper, we adopt Cardon et al.'s (2009) view of entrepreneurial passion as positive emotion for distinct entrepreneurial roles (see also; Collewaert et al., 2016; Gielnik et al., 2015; Huyghe et al., 2016). More specifically, entrepreneurial passion is defined as "consciously accessible, intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful and salient to the self-identity of the entrepreneur" (Cardon et al., 2009: 517). Whereas several alternative views on passion in entrepreneurship have their own merit (e.g., Baum and Locke, 2004; Chen et al., 2009; Shane et al., 2003; Vallerand et al., 2003), Cardon et al.'s (2009) conceptualization offers distinct advantages relevant to our research question. Above all, it is rooted in role identity theory (e.g., Powell and Baker, 2014, 2017; Stryker and Burke, 2000), which acknowledges the centrality of social interactions. According to role identity theory, entrepreneurs inhabit one or more roles, including founder or inventor, and socially construct their understanding of (and identification with) such roles through interactions with others. These others confer the defining sets of behavioral norms and expectations onto that role (Stryker and Burke, 2000). Accelerator program are, almost by definition, highly social environments, and peer-to-peer interactions are often at the core of these programs (Cohen et al., 2019; Hallen et al., 2020). On top of this, going into accelerators, entrepreneurs are often differentially passionate toward entrepreneurial activities, which set the basic requirement for studying selection and contagion processes (de Mol et al., 2020).

While earlier studies position passion as the self-contained motivational source fueling the pursuit of entrepreneurial activity (Cardon et al., 2013), more recent studies resonate with Murnieks et al.'s (2020: 2) observation that entrepreneurial passion "as a construct that originates in a uniquely solitary and intraindividual manner within a person, may be obscuring important interindividual considerations." Consequently, these studies investigate passion's effect on those surrounding the entrepreneurs, including investors, employees, and startup team members. For instance, Davis et al. (2017) find that investor perception of founder passion increases positive affect and the likelihood that they will invest. Similarly, Hubner et al. (2020) show that contact with passionate entrepreneurs makes employees more passionate, boosting organizational commitment. Finally, and most relevant to our investigation, Uy et al. (2021) show that working closely with other entrepreneurs on the same startup team makes individuals converge in their affective experience of passion for founding over time. Beyond defining entrepreneurial passion in general terms, Cardon et al. (2009) propose three distinct domains of entrepreneurial activity to which feelings of passion might be directed: founding, inventing, and developing. Passion for founding relates to setting up a new venture, becoming an owner, and engaging with early-stage efforts to obtain necessary human, social, and financial capital. Passion for inventing relates to identifying and pursuing new opportunities, and enjoying the innovative problem-solving process associated with the creation of new products and services. Passion for developing relates to growing and expanding the venture after the initial founding stage, and central activities revolve around obtaining growth capital from external investors or improving internal management structures. We follow the established practice (e.g., Boone et al., 2020; Collewaert et al., 2016; Gielnik et al., 2015) of omitting passion for developing because our focus is on nascent entrepreneurs in an early-stage accelerator program and passion for developing only becomes relevant at later stages.

In line with the idea that entrepreneurial passion involves an identity component as well as an affective one, each domain of entrepreneurial passion has two dimensions: identity centrality and intense positive feelings (Cardon et al., 2009; Cardon et al., 2013). Identity centrality denotes the consciously accessible, self-ascribed importance of "what it means to be an entrepreneur" (Murnieks et al., 2014: 1589), including its meaning in hierarchical distinction to other identities (Stryker and Serpe, 1994). Entrepreneurs differ in their sense of core identity (e.g., founder, developer, inventor) (Murnieks et al., 2020). Entrepreneurs for whom being a founder is central, for instance, are more likely to experience passion when engaging in activities related to this identity such as hiring new employees or securing venture capital (Cardon et al., 2009). Intense positive feelings are conscious changes in core affect experienced as "excitement, elation, and joy" (Cardon et al., 2009: 515) attributable to engagement in activities that are meaningful to an entrepreneur's identity (Baron, 2008; Chen et al., 2009).

3.2. Entrepreneurial passion and homophily effects

Homophily is the tendency to associate with similar others (e.g., Ertug et al., 2022; Lawrence and Shah, 2020; McPherson et al., 2001). A considerable amount of research emphasizes the link between the observed homogeneity of entrepreneurial networks and homophily based not only on an array of shared attributes including gender, ethnicity, or education (e.g., Aldrich and Kim, 2007; Ruef et al., 2003; Vissa, 2011), but also on perceptions of the world around us (Parkinson et al., 2018). In this vein, investors are found to prefer entrepreneurs who share their thinking styles and professional backgrounds (Claes and Vissa, 2020; Franke et al., 2006; Murnieks et al., 2011). It is even possible for shared identities stemming from similar traditions, experiences, or traumas, for example, to be used as a leverage to create interpersonal attraction (Phillips et al., 2013). Acknowledging this wide range of attributes consistent with the homophily mechanism, McPherson et al. (2001) build on Lazarsfeld and Merton (1954) to classify them into *status* attributes (e.g., demographics, education, occupation) and *value* attributes (e.g., values, attitudes, beliefs). McPherson et al. (2001: 419) suggest that *values* broadly include a "wide variety of internal states presumed to shape our orientation toward future behavior," and Lawrence and Shah (2020) specifically position cognitions and emotions within this category.

Although no study to date has identified shared entrepreneurial passion as an attribute that amplifies associations between entrepreneurs, the passion literature consistently conceptualizes entrepreneurial passion as "identity-focused affect" (Cardon et al., 2017: 286), while theories of emotion position positions affect as an attribute individuals use to assess their sense of similarity to others (Barsade and Gibson, 1998). Central to these arguments is the claim that passion is readily observable and thus can be used as a criterion for selection. This is the case for intense positive feelings because "the experience of passion will lead entrepreneurs to display their situational emotions more frequently and intensely" (Cardon, 2008: 79), as well as for identity centrality. For instance, Hubner et al. (2020) show that potential employees can pick up on entrepreneur's identity displays in video pitches where entrepreneurs talk about how activities related to inventing, founding, or developing are important and meaningful to them. Therefore, in line with Lawrence and Shah's (2020) categorization of "emotions" and "cognitions" that inform and spur the formation of social ties, we suggest that homophilous ties between peer entrepreneurs can form on the basis of intense positive feelings and identity centrality—the key affective and cognitive dimensions of entrepreneurial passion (Cardon et al., 2009).

A review of the homophily literature suggests that associations between two individuals can be the result of (1) opportunity (i.e., availability of similar others) and (2) individual preference (i.e., given the choice, individuals prefer similar others). Yet, ties may also arise because (3) a shared understanding develops about what sharing a specific attribute in a given social context implies, which then influences individual preferences (i.e., socially constructed homophily). For example, when two entrepreneurs mutually regard being a "founder" or "inventor" as central to their self-identities, the propensity that they will meet is higher, because that role identification leads them to privilege activities and social environments consistent with that role (e.g., investor pitch training for founders) (Burke and Reitzes, 1991; Goffman, 1959). When entrepreneurs engage in role-consistent activities, joy and enthusiasm are evoked and broadcasted publicly through facial expressions and body language (Cardon, 2008; Hubner et al., 2020). This increases entrepreneurs' capacity to attract similar others because positive experiences of emotions escape conscious emotion regulation more readily and can therefore be observed and used as a basis for selection (Gross, 1999). Moreover, entrepreneurs do not consider relationships with others in a vacuum; they base choices for affiliation on a shared sense of identity (Murnieks et al., 2014; Murnieks et al., 2020). Therefore, those that share a similar notion of centrality for a specific entrepreneurial role identity are more likely to associate with similar others and form networks more readily (Greenberg & Mollick, 2017; Lawrence and Shah, 2020). Taken together, we expect entrepreneurs to form ties with others who have similar levels of passion for founding. We expect the same for passion for inventing. Thus:

Hypothesis 1a. Similarity in passion for founding has a positive effect on network tie formation among entrepreneurs.

Hypothesis 1b. Similarity in passion for inventing has a positive effect on network tie formation among entrepreneurs.

3.3. Entrepreneurial passion and social contagion effects

Despite the theoretical rationale for expecting peer entrepreneurs to exhibit similar levels of entrepreneurial passion, given the homophilic potential, an alternative explanation would suggest that a shared sense of passion may be driven by a process of social influence. Social influence—otherwise referred to as "contagion"—describes the mechanism by which "a person or group influences the emotions or behavior of another person or group through the conscious or unconscious induction of emotional states and behavioral attitudes" (Schoenewolf, 1990: 50). For the contagion of emotions such as passion, both affective transfer as well as identity internalization processes are essential psychological mechanisms (for a review: Ashforth and Schinoff, 2016; Douglas et al., 2008).

On the one hand, social contact and emotional cues, such as non-verbal facial expressions and body movements (Barsade, 2002; Buck et al., 1992), are conduits for affective transfer mechanisms such as emotional mimicry (Hatfield et al., 1994; Hess and Fischer, 2013). For instance, with regards to entrepreneurial passion, Cardon (2008) proposes that employees may adopt passionate behaviors and expressions because they subconsciously mimic and then internalize passion displayed by others (also: Lazarus, 1991; Neumann and Strack, 2000). On the other hand, individuals might also consciously come to an understanding as to why others engage in certain behaviors after picking up, and reflecting upon, communications related to the meaning associated with an identity (Douglas et al., 2008; Hillebrandt and Barclay, 2017; Hubner et al., 2020). This cognitively elaborated process leads to internalization of identity displays because observers begin to view themselves through the eyes of others and understand the collective values and meanings behind certain entrepreneurial activities (Ashforth and Kreiner, 1999). In turn, this understanding can motivate engagement in similar behavior and thereby facilitate the emergence of similar emotions (Bagozzi and Lee, 2002; Sullins, 1991; Vallerand et al., 2014).

Although social contagion can have different sources, including supervisors and CEOs (Ho and Astakhova, 2020; Sy et al., 2005), mentors (Eesley and Wang, 2017), and entrepreneurial parents (Bosma et al., 2012), one type of social relationship—peers—has gained particular attention in entrepreneurship research (e.g., Ebbers and Wijnberg, 2019; Nanda and Sørensen, 2010; Kacperczyk, 2013). For instance, Nanda and Sørensen (2010) find that proximity to workplace peers with a background in entrepreneurship is associated with an increased likelihood of a person becoming an entrepreneur. Likewise, Ebbers and Wijnberg (2019) show that peers at school develop similar future entrepreneurial aspirations through social network ties and contact with peers. More recently, Uy et al. (2021) show that working closely with other entrepreneurs on the same startup team makes individuals converge in their affective experience of passion for founding over time.

On this basis, we propose that in situations where peer entrepreneurs are positioned to recognize social cues, whenever a focal entrepreneur expresses their passion, whether through speech, facial expressions and body movements (e.g., an inventor passionately tinkering on a technical product solution) or via identity displays (e.g., a founder at a pitch event broadcasting the meaning he or she derives from engaging in the entrepreneurial pursuit), a passion response may be evoked such that a similar magnitude of passion is internalized by the recipient (Barsade, 2002; Hatfield et al., 1994; Sullins, 1991; Vallerand et al., 2014). Thus:

Hypothesis 2a. There is a social contagion effect of passion for founding among peer entrepreneurs.

Hypothesis 2b. There is a social contagion effect of passion for inventing among peer entrepreneurs.

Thus far, we have positioned social interactions among peer entrepreneurs as a conduit to the transfer of entrepreneurial passion. This rationale can be extended to suggest that social contagion should be particularly strong when it comes to entrepreneurs on the same startup team. Because startup team members work together, social network ties within the cofounding team tend to be both deeper and more frequent compared to ties with other peers. The claim that social contagion between any two individuals increases with more interaction has received wide empirical support (e.g., Festinger et al., 1950; Kacperczyk, 2013; Lomi et al., 2011). For example, friends, in contrast to mere classmates at school, seem to be disproportionately influential with regards to career choices because they spend much time interacting with each other (Lomi et al., 2011). And, most convincingly, Kacperczyk (2013) shows that while university peers play a substantial role by influencing entrepreneurial entry in general, peers that are geographically and socially closer exert a greater influence. We therefore hypothesize that:

Hypothesis 3a. Social contagion effects of passion for founding are stronger for ties within the startup team than for peer ties outside the startup team.

Hypothesis 3b. Social contagion effects of passion for inventing are stronger for ties within the startup team than for peer ties outside the startup team.

4. Methods and data

4.1. Empirical setting

Our empirical setting is a university-based startup accelerator program that closely mimics traditional/private accelerators with an intensive time-bound program, where teams of student entrepreneurs receive education and support to start and/or advance their new ventures (Kaandorp et al., 2020; Souitaris et al., 2007). Over the course of five months, our sample experienced heavy workloads spread across practical workshops, lectures, mentor sessions, and, above all, their ongoing engagement with founding and running a new venture (e.g., Boss et al., 2021; Lyons and Zhang, 2018). Program alumni created expense management software, social networking platforms for coworking spaces, and IT solutions for property owners to manage tenants, for example. While some ventures do dissolve at the end of the program (as typical in other accelerators; e.g., Yu, 2020), it is not rare for alumni startups to demonstrate strong growth following the program, with some teams securing external investments to further scale their operations, and several reaching an exit (e.g., via acquisition).

While we acknowledge the potential caveats associated with studying student entrepreneurs more generally, there are several reasons why we deem this sample appropriate to our research question. First, participants in our study represent the population of interest, as they do indeed create and run real businesses within an accelerator setting, including key entrepreneurial activities like legal registration, product development and testing, and selling (e.g., Arenius et al., 2017; Reynolds, 2017; Reynolds and Miller, 1992). The notion that entrepreneurial passion is evoked through meaningful "engagement in entrepreneurial activities" (Cardon et al., 2009: 525) is also consistent with the specific theory we speak to. Second, the specific phenomena we study in terms of homophily selection and social contagion are grounded in broad theory about social interaction (Hsu et al., 2017; Stevens, 2011) and as such should apply in our specific empirical context too. Finally, it is not surprising that similar samples are extensively used in empirical studies on entrepreneurial passion (e.g., Gielnik et al., 2017; Lex et al., 2020).

4.2. Method

We use the Simulation Investigation for Empirical Network Analysis (SIENA) as our main analytical framework.[2] SIENA, is an actor-oriented statistical model for studying the co-evolution of networks and individual actor characteristics (Steglich et al., 2006). SIENA uses panel data to specifically separate endogenous structural network effects from exogenous actor level effects[3] thereby allowing researchers to statistically separate often highly correlated effects of network structure, selection, and social contagion. While data are recorded at discrete points in time (i.e., panel data), the model assumes continuous change in network ties and entrepreneurial passion between waves. Statistically, continuous change between discrete panel waves is modeled as a stochastic process utilizing a Markov chain (Snijders et al., 2007). This means that observed changes in peer networks and entrepreneurial passion are broken down into mini-steps (i.e., sequences of many small changes). The exact ordering of mini-steps is varied using simulations and used for hypothesis testing. During each of these mini-steps, an entrepreneur is presumed to decide whether to form or dissolve a tie to another entrepreneur or to adjust his or her entrepreneurial passion. In the next mini-step, the future network and passion state is predicted solely as a function of the current network and passion state without "memory" of the entire historical sequence of events from which the current state has evolved (Snijders et al., 2010; Steglich et al., 2010).

SIENA models mini-steps by specifying and maximizing two separate multinominal logistic functions called evaluation functions for network tie change and actor behavior change (i.e., passion), respectively (Snijders, 2001). Evaluation functions are the primary determinant for the probability of change at each mini-step and incorporate effects that are specified by the researchers (i.e., independent variables); effects are to be interpreted as contributions to log probabilities of increasing network ties or changing behavior (Ripley et al., 2022). Finally, to capture the co-evolution of networks and behavior, SIENA consolidates both evaluation functions, thereby mutually controlling one for the other (Steglich et al., 2010).

4.3. Sample and data collection

In total, we collected four waves of social network and individual actor level data. Unlike other studies (Collewaert et al., 2016; Lex et al., 2020; Uy et al., 2021), we were able to use the particular setup of the accelerator program to collect the first wave of data *after* individual participants signed up but *before* the program officially started. In this first wave, we established constant actor attributes (e.g., age, sex, education, previous founding experience), changing actor attributes (i.e., entrepreneurial passion), and existing social network ties to other participants as a baseline. At the onset of the program, all participants received rudimentary guidance about team formation suggesting that they maintain diversity in terms of gender, study background, work experience, and country of origin; aim for 3–4 people per team, and promote psychological safety (e.g., Edmondson, 1999). We confirmed that entrepreneurial passion was not part of these team formation instructions.

In total, entrepreneurs formed 33 startups, out of which five were founded by solo entrepreneurs ($M_{startup} = 2.94$; $SD = 1.06$). Following our baseline measure and team formation, we surveyed entrepreneurs during weeks 6, 12, and 18 of the program, which we labelled "start," "midpoint," and "end," respectively. These three waves captured the entrepreneurs' and their startup teams' feedback immediately after team formation, during the program, and in the week leading up to demo day—all critical junctures in the accelerator program and participants' entrepreneurial development. The second through fourth wave were identical to the baseline except that we dropped constant actor attributes because these (e.g., birth year) do not change over time (see Appendix A for an overview of measures across waves).

SIENA relies on high response rates to estimate network evolution in a stable manner. As a rule of thumb, an 80% response rate should be considered the bare minimum, to avoid any assumptions that the missing data are absent by chance (Huisman and Steglich, 2008; Ripley et al., 2022; Sparrowe et al., 2001). Therefore, to further incentivize participation, we conducted lotteries for participants to win vouchers totaling €500 for a familiar online shop during each wave of measurements. All waves exceeded acceptable response rate thresholds and ranged from 83% (end) to 97% (midpoint).

At baseline, the cohort consisted of 102 individual participants. Following recommendations for longitudinal designs (Ployhart and Vandenberg, 2010), our final sample comprised all participants who took part in at least two measurement waves. We removed ten participants—six of which were program dropouts—that had not responded to more than two waves. Three additional participants could not be selected as social network ties by other entrepreneurs in the program because they were absent from participation records (i.e., records provided by program management that were used to build the name generator in our survey). In total, we excluded those 13 cases from all four waves of data. To test for non-response bias, we compared these 13 cases with the final sample of 89 respondents. There were no significant differences between respondents and non-respondents for all measures at baseline.

[2] We used the software package RSIENA 1.2-23. For a detailed mathematical treatment of SIENA, we refer the reader to Snijders et al. (2007). For a tutorial introduction to SIENA, we refer the reader to Steglich et al. (2006). Finally, for a hands-on explanation about how to use SIENA, including an overview of all its different effects and how to interpret them, we refer the reader to Appendix B as well as the latest version of the RSIENA user's manual (Ripley et al., 2022) available for download from the SIENA website.

[3] Covariates or actor level effects are exogenous in the sense that their values are not modeled but used to explain network or behavior change. Passion change in the behavior part of the model is endogenous. We thank an anonymous reviewer for helping us clarifying this point.

4.4. Measures

4.4.1. Social networks

We generated social networks by asking "With which students in the [entrepreneurship program name] do you spend your free time with?" to mitigate the risk involved in mixing the given structure of the accelerator program with the voluntary choice of actors. We followed an interactionist approach, instructing participants to select cohort members they interacted with across informal social activities such as coffee or cigarette breaks (Kleinbaum et al., 2015). Independent of the startup team, participants could select up to ten cohort members. This is in line with other social network studies that tend to use a maximum of 10 names to avoid respondent fatigue (Brace, 2018). After each wave w we generated social network matrices of size $N = 89$. In each matrix, the cell x_{ijw} is equal to 1 if the row participant i reported a tie to the column participant j at that wave w, otherwise $x_{ijw} = 0$. Consequently, we created social networks based on 31,328 non-independent observations from 7,832 pairs of actors (89 × 88) across four waves.

4.4.2. Entrepreneurial passion

We measured passion at the level of the individual entrepreneur (rather than the team) using Cardon et al.'s validated scales (Cardon et al., 2013) as we were interested in modeling actor-driven networks where individual entrepreneurs select, maintain, or remove ties to other entrepreneurs between waves (Snijders et al., 2010). We accounted for two domains of entrepreneurial passion: passion for founding and passion for inventing. Within the domains of founding and inventing, there are two dimensions: intense positive feelings toward a founding or inventing activity and identity centrality, which refers to the importance of the activity to the person's identity (Murnieks et al., 2014).

Passion for founding was measured using three items, each capturing the experience of intense positive feelings associated with founding, and an additional single-item measure for the centrality of the founder role. Sample items include: "Establishing a new company excites me", (i.e., intensive positive feelings), and "Being the founder of a business is an important part of who I am" (i.e., identity centrality). All items were keyed on a 1–5 Likert scale. Passion for founding demonstrated satisfactory reliability ranging from 0.68 to 0.83 across the four waves.

Passion for inventing was measured with four items capturing the experience of intensive positive feelings for inventing and an additional single-item measure for the identity centrality of the inventor role. Sample items include: "Searching for new ideas for products/services to offer is enjoyable to me," (i.e., intensive positive feelings), and "Inventing new solutions to problems is an important part of who I am" (i.e., identity centrality). All items were keyed on a 1–5 Likert scale. Passion for inventing demonstrated satisfactory reliability ranging from 0.77 to 0.88 across the four waves.

Finally, in line with Cardon et al.'s (2013) recommendation, we considered passion to be the composite of those two components and obtained passion scores by averaging the experience of intensive positive feelings and multiplying this by the single identity centrality item (e.g., Cardon and Kirk, 2015). To fit the SIENA model, which relies on categorical variables to model changes in attitudes and allows only for a limited number of categories (Ripley et al., 2022), we transformed the passion scores to fit five categories. All scale transformations can be found in Appendix A.

4.4.3. Startup team membership

To account for differential opportunities for social network tie formation, we drew on records provided by the accelerator program manager and slides used by startup teams during their demo day pitches to create *same startup team* as a control variable. As members might enter and leave teams with implications for team characteristics and processes (Knight et al., 2019), we captured team membership with a changing dyadic covariate w_{ij} (Ripley et al., 2022). w_{ij} is the dyadic tie variable between actors i and j which equals 1 if they are on the same team and 0 otherwise.

4.4.4. Controls

Control variables were measured at baseline and included entrepreneurs' *age*, *sex, education*, and *entrepreneurial experience*. Four entrepreneurs included in the final sample did not respond to the baseline. These missing data were imputed using median scores[4] (i.e., age: 21; no entrepreneurial experience) or complemented from additional information such as profile pictures used in demo day presentations (i.e., sex) and supplementary records provided by the program director (i.e., education).

5. Results

5.1. Descriptives

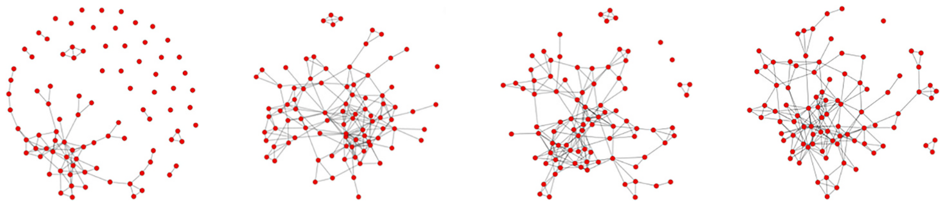
Table 1 summarizes the key descriptive statistics of the network data. First, we measured network density by dividing the number of realized ties by the total number of potential ties at the level of the cohort. The total number of ties increased from 130 (i.e., Wave 1) to 339 ties (i.e., Wave 4) over time. Fewer entrepreneurs participated in Wave 4 which explains the lower absolute number of ties in that wave as compared to Wave 3. Second, SIENA requires a certain range of network stability between waves. The Jaccard index is used to gauge the stability of the network between successive waves and can range from 0 to 1. Higher scores indicate greater stability

[4] To ensure imputation did not alter our results, we performed a robustness test without imputation (see Appendix C). Robustness results are identical with findings reported in Table 3.

Table 1
Descriptive network statistics SIENA ($N = 7{,}832 \times T = 4$ waves).

	Wave 1	Wave 2	Wave 3	Wave 4
Network				
Total number of ties	130	297	339	299
Density	0.017	0.043	0.045	0.046
Avg. number of outgoing ties	1.529	3.759	3.942	4.041
Min. number of outgoing ties	0	0	0	1
Max. number of outgoing ties	9	10	10	10
Jaccard index	–	0.257	0.532	0.657
Startup teams				
Number of teams	–	28	29	29
Avg. team size	–	3.29	3.15	3.21
Number of solo founders	–	5	4	4

Network visualization



Note: n = 89. Density = total number of ties / Nodes ´(Nodes - 1). Network visualization graphs were created using the Fruchterman-Reingold algorithm in *R v4.0.3* (R Core Team, 2020) utilizing the *igraph v1.2.6* (Csárdi and Nepusz, 2006). Entrepreneurs are represented by red circles; lines indicate a network tie.

(and less change in the network configuration from one wave to the next), whereas lower scores indicate less stability (and more network change going from one wave to the next). Generally, Jaccard values of 0.3 and higher are considered good whereas values lower than 0.2 might pose estimation difficulties (Snijders et al., 2010). In our data, the Jaccard index between each wave is 0.26, 0.53, and 0.66, respectively. Hence, there is more network change comparing Wave 1 and Wave 2 than Wave 2 and Wave 3 and so on (see visualizations provided in the lower panel of Table 1). Taken together, these descriptive statistics show that participants—many of whom were strangers initially—formed new ties throughout the program but particularly in the period between Wave 1 and Wave 2 when the number of ties jumped from 130 to 297.

Table 2 summarizes the means, standard variations, and correlations. Four patterns emerge as relevant to our analytical approach. First, there is a positive correlation between previous founding experience and passion for founding in Wave 1, Wave 2, and Wave 3. A more detailed analysis revealed significant correlations ranging from $r = 0.22$ to $r = 0.28$ between founding experience and identity centrality of passion for founding across all four waves (all p's < 0.05) indicating that the identity of being a founder is a more central self-concept to entrepreneurs who have established businesses before (Murnieks et al., 2014). There are significant correlations ranging from $r = 0.51$ to $r = 0.71$ between the passion domains of inventing and founding for each wave of data collection. These observations suggest that passion domains share a moderate amount of variance (e.g., $.51^2 = 26\%$) but remain distinct constructs (Cardon et al., 2013). We further established significant correlations within domains over time in the range of $r = 0.54$ to $r = 0.75$ suggesting that passion levels are somewhat enduring (Cardon et al., 2013). Correlations of this magnitude are consistent with prior longitudinal research (e.g., Cardon et al., 2013; Collewaert et al., 2016; Lex et al., 2020) and suggest that passion is sufficiently dynamic to model contagion effects (Uy et al., 2021). Finally, the mean passion levels (both founding and inventing) diminished slightly, while passion variances increased. This interesting observation reflects research on accelerator programs and entrepreneurship education more generally, which suggests that entrepreneurs in those programs either quickly discover what they enjoy or accelerate their realization of what they do not enjoy (Shankar and Clausen, 2020).

5.2. *Simulation-based results*

Table 3 reports the results for passion for founding (Model 1–3) and passion for inventing (Model 4–6) obtained from the SIENA analyses. Insofar as the results are similar, we take passion for founding (Model 1) as an example to describe how results should be interpreted. Although SIENA as a method has recently made inroads into entrepreneurship research (Ebbers and Wijnberg, 2019), it is still a relatively new tool for scholars in our field. Therefore, in addition to the model and the findings obtained from it that we report in the text below, we also present an extensive overview of all effects—including their mathematical representation, general interpretation, as well as their (non-technical) interpretation based on our specific study—in Appendix B.

5.2.1. *Structural network effects*

The *rate* parameter for the network as an outcome variable indicates the frequency with which entrepreneurs change their ties to

Table 2
Descriptive statistics including means, standard deviations, and correlations.

	Attribute	Wave	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
Controls																
1	Age	W1	20.99	1.15												
2	Sex[a]	W1	0.74	0.44	0.017											
3	Education[b]	W1	0.72	0.45	0.081	−0.083										
4	Experience[c]	W1	0.21	0.41	0.053	−0.068	0.082									
Passion for																
5	Founding	W1	3.74	0.97	0.050	0.065	0.084	0.233*	(0.679)							
6	Inventing	W1	4.08	0.82	0.050	0.126	−0.101	0.084	0.449**	(0.769)						
7	Founding	W2	3.87	0.94	0.110	0.019	−0.031	0.235*	0.661**	0.425**	(0.836)					
8	Inventing	W2	3.95	0.93	0.140	0.001	−0.096	0.160	0.332**	0.526**	0.608**	(0.803)				
9	Founding	W3	3.73	1.11	0.015	−0.051	−0.174	0.280**	0.492**	0.338**	0.647**	0.479**	(0.769)			
10	Inventing	W3	3.94	0.87	−0.122	0.081	−0.101	0.166	0.377**	0.468**	0.507**	0.647**	0.615**	(0.792)		
11	Founding	W4	3.54	1.13	0.108	0.075	0.025	0.196	0.594**	0.394**	0.692**	0.510**	0.684**	0.622**	(0.825)	
12	Inventing	W4	3.81	0.92	0.031	0.166	−0.036	0.136	0.333**	0.551**	0.428**	0.554**	0.435**	0.665**	0.655**	(0.800)

Note: n ranging between 73 and 89.
[a] Female = 0, male = 1.
[b] No business education = 0, business education =1.
[c] No founding experience = 0, previous founding experience = 1.
Internal consistency: Cronbach Alpha (diagonal).
[*] Correlation is significant at the 0.05 level (2-tailed).
[**] Correlation is significant at the 0.01 level (2-tailed).

Table 3
Results SIENA analyses.

Variable		Passion for founding			Passion for inventing		
		Model 1: cohort	Model 2: team	Model 3: extra-team	Model 4: cohort	Model 5: team	Model 6: extra-team
		Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Network as outcome							
	Rate t1-t2	19.341** (5.309)	18.787** (4.827)	19.028** (5.298)	18.762** (3.612)	18.880** (4.836)	18.789** (3.873)
	Rate t2-t3	6.298** (0.763)	6.303** (0.836)	6.284** (0.783)	6.221** (0.791	6.223** (0.816)	6.233** (0.784)
	Rate t3-t4	3.888** (0.511)	3.885** (0.516)	3.892** (0.522)	3.927** (0.539)	3.923** (0.541)	3.915** (0.554)
	Outdegree	−3.299** (0.256)	−3.292** (0.252)	−3.294** (0.263)	−3.304** (0.246)	−3.291** (0.253)	−3.295** (0.245)
	Reciprocity (R)	2.490** (0.278)	2.510** (0.296)	2.511** (0.295)	2.498** (0.296)	2.518** (0.304)	2.523** (0.289)
	Transitivity (T)	1.866** (0.143)	1.873** (0.143)	1.869** (0.152)	1.876** (0.142)	1.880** (0.150)	1.881** (0.135)
	R × T	−0.380 (0.366)	−0.374 (0.370)	−0.387 (0.407)	−0.376 (0.374)	−0.417 (0.389)	−0.409 (0.370)
	Indegree alter	−0.027 (0.037)	−0.029 (0.036)	−0.028 (0.038)	−0.016 (0.034)	−0.017 (0.035)	−0.018 (0.036)
	Outdegree alter	−0.183** (0.044)	−0.185** (0.042)	−0.185** (0.044)	−0.197** (0.042)	−0.194** (0.042)	−0.197** (0.045)
	Outdegree ego	0.036* (0.013)	0.036* (0.013)	0.036* (0.013)	0.036* (0.014)	0.036* (0.014)	0.037* (0.013)
	Same team	2.273** (0.183)	2.281** (0.182)	2.280** (0.186)	2.292** (0.171)	2.280** (0.171)	2.286** (0.166)
Entrepreneurial passion							
	Alter	−0.034 (0.070)	−0.032 (0.076)	−0.036 (0.078)	−0.081 (0.100)	−0.080 (0.102)	−0.076 (0.102)
	$Alter^2$	0.119 (0.064)	0.124 (0.068)	0.118 (0.066)	0.001 (0.095)	0.003 (0.096)	−0.010 (0.093)
	Ego	0.078 (0.085)	0.077 (0.086)	0.068 (0.088)	0.089 (0.112)	0.088 (0.112)	0.084 (0.107)
	Ego^2	−0.008 (0.082)	−0.009 (0.090)	−0.004 (0.095)	0.082 (0.104)	0.080 (0.102)	0.084 (0.099)
H1	$(Ego - Alter)^2$	−0.071* (0.034)	−0.072* (0.035)	−0.071* (0.034)	−0.062 (0.051)	−0.061 (0.049)	−0.064 (0.050)
Controls							
Age							
	Alter	0.074 (0.047)	0.074 (0.050)	0.076 (0.049)	0.079 (0.049)	0.082 (0.050)	0.078 (0.049)
	$Alter^2$	0.046 (0.027)	0.047 (0.026)	0.045 (0.027)	0.041 (0.027)	0.040 (0.027)	0.042 (0.028)
	Ego	0.047 (0.059)	0.050 (0.059)	0.046 (0.058)	0.052 (0.057)	0.052 (0.059)	0.053 (0.059)
	Ego^2	0.0255 (0.029)	0.025 (0.029)	0.027 (0.027)	0.027 (0.028)	0.026 (0.028)	0.025 (0.029)
	$(Ego - Alter)^2$	−0.0243 (0.016)	−0.025 (0.016)	−0.025 (0.016)	−0.025 (0.016)	−0.025 (0.016)	−0.025 (0.016)
Sex (male = 1)							
	Alter	−0.218* (0.104)	−0.220* (0.107)	−0.216* (0.105)	−0.210* (0.102)	−0.207* (0.104)	−0.205* (0.104)
	Ego	−0.126 (0.125)	−0.126 (0.124)	−0.124 (0.127)	−0.130 (0.124)	−0.134 (0.127)	−0.133 (0.129)
	Same	0.323** (0.095)	0.325** (0.097)	0.327** (0.099)	0.326** (0.097)	0.324** (0.104)	0.326** (0.099)
Education (business = 1)							
	Alter	0.080 (0.119)	0.080 (0.122)	0.083 (0.120)	0.083 (0.119)	0.087 (0.119)	0.091 (0.118)
	Ego	−0.273 (0.150)	−0.271 (0.149)	−0.273 (0.147)	−0.259 (0.148)	−0.264 (0.153)	−0.272 (0.149)
	Same	0.395** (0.108)	0.393** (0.110)	0.395** (0.111)	0.396** (0.111)	0.387** (0.110)	0.390** (0.109)
Entrepreneurial experience (yes = 1)							
	Alter	0.055 (0.127)	0.058 (0.128)	0.053 (0.129)	0.039 (0.120)	0.038 (0.122)	0.035 (0.125)
	Ego	0.018 (0.142)	0.013 (0.146)	0.021 (0.142)	0.066 (0.136)	0.061 (0.142)	0.056 (0.1135)
	Same	−0.203 (0.117)	−0.205 (0.118)	−0.209 (0.116)	−0.185 (0.117)	−0.188 (0.116)	−0.191 (0.122)
Passion as outcome							
	Rate t1-t2	1.427** (0.327)	1.477** (0.327)	1.503** (0.365)	1.962** (0.486)	1.922** (0.511)	1.947** (0.491)
	Rate t2-t3	1.468** (0.340)	1.442** (0.314)	1.438** (0.330)	1.089** (0.254)	1.080** (0.244)	1.069** (0.244)
	Rate t3-t4	1.359** (0.295)	1.379** (0.302)	1.343** (0.299)	1.149** (0.247)	1.157** (0.273)	1.149** (0.253)
	Linear shape	0.165 (0.098)	0.152 (0.094)	0.156 (0.090)	0.098 (0.104)	0.086 (0.102)	0.075 (0.106)
	Quadratic shape	−0.133 (0.082)	−0.100 (0.067)	−0.039 (0.058)	−0.203* (0.082)	−0.219* (0.084)	−0.215* (0.082)
Contagion of passion							
H2	Avg. alter	0.724* (0.299)			0.191 (0.302)		
H3	Avg. alter × team		0.436* (0.165)			0.303 (0.208)	
H3	Avg. alter × extra-team			0.084 (0.245)			−0.573 (0.460)

Note: All analyses were run with unconditional estimation, centered covariates (except for *team* which was used in interaction) and 5000 iterations to rule out chance findings. Reported coefficients are non-standardized. Standard errors reported in parentheses. As *age* is continuous, we employed a squared difference effect. All models fulfilled standard convergence thresholds: all convergence *t*-ratios < 0.07; all overall maximum convergence ratios < 0.25 (Ripley et al., 2022).

* $p < .05$
** $p < .01$

other entrepreneurs. The large coefficient representing the network change from Wave 1 to Wave 2 is explained by most entrepreneurs being mutual strangers before the start of the program. To control for actor position and embeddedness in the network, we included *outdegree*, *reciprocity*, *transitivity*, as well as *degree-related* and *team* effects, which can be understood as basic structural effects that can affect the subsequent formation of network ties (Snijders et al., 2010; Snijders and Lomi, 2019).

The *outdegree* parameter is the intercept for the sub-models predicting network ties and measures how likely entrepreneurs are to send ties to each of their cohort peers. A negative outdegree parameter (e.g., Model 1: −3.299, $p < .01$) shows that the average entrepreneur is tied to less than half of the cohort and indicates that network densities are low (Ripley et al., 2022).

Reciprocity was significant across all models (e.g., Model 1: 2.490, $p < .01$) indicating a general tendency to reciprocate incoming ties (i.e., entrepreneur *i* is more likely to nominate[5] entrepreneur *j* as a tie when entrepreneur *j* nominates entrepreneur *i* as a tie, and vice versa).

Transitivity, the tendency to 'befriend the friends of one's friends,' is measured by the *geometrically weighted edgewise shared partners* (GWESP) effect (Davis, 1970; Ripley et al., 2022). We observed a significant transitivity effect (e.g., Model 1: 1.866, $p < .01$), indicating a tendency for network closure, which means entrepreneurs form and maintain ties with their alters' alters. We also included the interaction of *transitivity* and *reciprocity* effects (R × T) to control for their tendency to offset one another (Block, 2015).

Next, we included degree-related network effects including *indegree alter* (i.e., tendency to attach to popular actors), *outdegree alter* (i.e., tendency to be tied to actors that have many outgoing ties), and *outdegree ego*[6] effects (i.e., tendency of actors with many outgoing ties to continue sending out new ties), which represent basic properties of network dynamics and should be included to avoid confounding theoretically relevant covariate effects with general processes of network formation (Ripley et al., 2022). We did not find a significant indegree alter effect. Outdegree alter was significant and negative (e.g., Model 1: −0.183, $p < .01$) while outdegree ego was significant and positive (e.g., Model 1: 0.036, $p < .05$) indicating that entrepreneurs with high outdegrees are less popular as social network ties in general yet express a tendency to nominate many more entrepreneurs as ties. Finally, we included the changing dyadic covariate *same startup team* to control for the tendency of entrepreneurs to establish ties with entrepreneurs on the same team more readily. This effect was positive and significant (e.g., Model 1: 2.273, $p < .01$).

5.2.2. *Entrepreneurial passion and actor-level controls*

Next, with respect to covariate effects for entrepreneurial passion as well as our controls for age, sex, education, and entrepreneurial experience, we specified *alter* (i.e., the degree to which covariate affects the number of incoming ties) and *ego* (i.e., the degree to which covariate affects the number of outgoing ties) effects. To test for homophily, *same* or *difference squared effects* were specified depending on whether the actor attribute is dichotomous (i.e., sex, education, entrepreneurial experience) or categorical/continuous (i.e., entrepreneurial passion, age).

Whereas the *same* effect expresses homophily in terms of absolute difference between attribute value of ego and alter alone, the *difference squared* effect draws on a parametric set of functions including alt^2 and ego^2 to control for non-linearities (Schaefer and Kreager, 2020; Snijders and Lomi, 2019). For instance, passion homophily may be confounded with other mechanisms including aspiration (i.e., attraction to high values of passion), attachment conformity (i.e., attraction to a passion value common or normative for actors in the network), and sociability (i.e., the inclination of high passion entrepreneurs to make many tie choices).[7] Only a parametric set of functions can model these mechanisms accordingly because the location of the optimum can be close to ego's value to represent homophily, can be drawn toward a common (normative) value to represent attachment conformity, and can be higher or lower to represent aspiration (Snijders and Lomi, 2019). Significant *same* or *difference squared parameters* indicate that the smaller the difference between the covariates of ego and alter, the more likely there is a tie between two actors.

5.2.2.1. *Entrepreneurial passion.*

In partial support of Hypothesis 1, we found a significant homophily effect for passion for founding (Hypothesis 1a; Model 1: −0.071; $\chi^2(1) = 5.20$; $p = .023$) but not inventing (Hypothesis 1b; Model 4: −0.062, $\chi^2(1) = 1.65$; $p = .199$). Our results with regards to passion for founding can be interpreted as follows: All else being equal, the probability that we will observe an entrepreneur *i* with high passion for founding (e.g., $z_i = 5$) connecting with entrepreneur *j* with high passion for founding (e.g., $z_j = 5$) is 3.11 times larger than the probability of entrepreneur *i* forming a tie with another entrepreneur *h* with low passion for founding (e.g., $z_h = 1$).[8]

5.2.2.2. *Constant actor attributes (controls).*

Again, we test *alter*, *ego*, and *same* effects for all control variables except age for which we specified ego^2, alt^2, and *difference squared* effects. We found significant same sex (e.g., Model 1: 0.323, $p < .01$) and same education (e.

[5] Following the standard approach used by the SIENA research community, we use the word *nominate* throughout the paper to express that entrepreneur *i* states a tie exist to entrepreneur *j*—independent of what entrepreneur *j* states. Such a tie is bidirectional only if entrepreneur *j* also nominates entrepreneur *i* as a network tie; It is unidirectional otherwise.

[6] In many applications of social network analysis, including SIENA, "ego" and "alter" effects are also referred to as "activity" or "sender" and "popularity" or "receiver" effects respectively. To use consistent terminology, we will go on referring exclusively to ego and alter effects.

[7] For a detailed mathematical derivation as well as shortcomings of a linear modeling approach for homophily in terms of absolute difference between ego's and alter's passion, we refer to Snijders and Lomi (2019). For a more in-depth interpretation of our modeled effects, we also refer readers to Appendix B.

[8] Assuming *j* and *h* are equivalent in all other respects, the probability that *i* will connect to *j* instead of *h* in the next mini-step is calculated via the diffSqX effect in SIENA: $\exp(-0.071 \times ((z_i - z_j)^2 - (z_i - z_h)^2)) = \exp(-0.071 \times ((5-5)^2 - (5-1)^2)) = 3.11$.

g., Model 1: 0.395, $p < .01$) effects reflecting the tendencies of entrepreneurs to prefer ties with others of the same sex and educational background. In addition, we established an alter effect of sex (e.g., Model 1: −0.218, $p < .05$), indicating that entrepreneurs nominate females as ties more often—which is likely a remnant of team formation instructions within the program advocating for team gender diversity.

5.2.3. Passion contagion

The bottom half of Table 3 reports the results for the behavior as outcome models that we label 'passion as outcome'. Again, we distinguished between passion for founding (Model 1–3) and passion for inventing (Model 4–6), and refer to Appendix B for a comprehensive interpretation of all effects. The *rate parameter* indicates whether entrepreneurs increased, decreased, or did not change their entrepreneurial passion between waves. The *linear* and *quadratic shape* effects address passion itself and control for the basic shape of an entrepreneurs' passion over time. While a significant (and positive) *linear shape* effect indicates that entrepreneurs prefer more extreme values of passion, a significant (and negative) *quadratic shape* effect indicates the general preference for mid-ranged values of entrepreneurial passion (Ripley et al., 2022). We found no clear preference for passion for founding (i.e., Model 1–3; all p's = n.s.), yet entrepreneurs in our sample expressed a more unimodal trend toward mid-range values of passion for inventing (i.e., Model 4–6; Model 4: −0.203, $p < .05$).

Finally, to test for social contagion, we employed the *average alter* effect which captures the tendency for entrepreneurs whose network ties have higher average passion scores, to also score highly on passion, and thus become more similar to their network ties over time (Daza and Kreuger, 2021; Ripley et al., 2022). First, to test Hypotheses 2a and 2b, we modeled social contagion processes at the accelerator cohort level. Here, the modeled *average alter* effect is defined as the product of an entrepreneur's passion and the average passions of all entrepreneurs in the cohort to whom a tie exists (Ripley et al., 2022). We found a positive and significant effect for passion for founding (i.e., Hypothesis 2a) (Model 1: 0.724; $\chi^2(1) = 9.68$; $p = .002$), yet no significant effect for passion for inventing (i.e., Hypothesis 2b) (Model 4: 0.191; $\chi^2(1) = 0.26$; $p = .609$). This means that when comparing an entrepreneur whose ties are 0.724 units higher on passion for founding than network ties of another entrepreneur, the odds of increasing passion for founding compared to no change more than double ($exp(0.724) = 2.062$).

Second, to test Hypotheses 3a and 3b and model contagion from co-founders more specifically, we weighted the *average alter* effect by team membership coded as 1 if two entrepreneurs are part of the same startup team and 0 otherwise. Again, we found a significant contagion effect for passion for founding (Model 2: 0.436; $\chi^2(1) = 7.72$; $p = .006$) but not for passion for inventing (Model 5: 0.303; $\chi^2(1) = 2.22$; $p = .136$). To test contagion from ties with cohort members that were not on the same startup team as the ego entrepreneur (henceforth: extra-team ties), we followed the procedure from step two but coded these extra team ties as 1 and team members as well as entrepreneurs to whom no tie exists as 0. We established no contagion effects for passion for founding (Model 3: 0.084; $\chi^2(1) = 0.13$; $p = .720$) nor passion for inventing (Model 6: −0.573; $\chi^2(1) = 1.48$; $p = .224$). Taken together, we carefully conclude that for passion for founding, contagion at the team level was stronger than contagion from ties outside the team. Passion for inventing was not contagious.

5.3. Selection versus contagion

To better explain why socially connected entrepreneurs are more likely to exhibit similar passion for founding, we sought to understand the relative contribution of homophily selection and social contagion by decomposing network autocorrelation associated with each of these co-evolution mechanisms (Leszczensky and Pink, 2019; Steglich et al., 2010).[9] Network autocorrelation can be defined as the spatial correlation between attributes of actors (e.g., passion) within a network (Anselin and Bera, 1996; Haining, 2001). Consistent with prior work (e.g., Plummer and Acs, 2014), we measure network autocorrelation by computing Moran's *I*. Moran's *I* ranges from −1 to 1 whereby higher (lower) values indicate that socially connected entrepreneurs have similar (dissimilar) values in passion. A Moran's *I* of 0 indicates spatial randomness (see Appendix B for formula).

We compare empirical realizations of network autocorrelation to network autocorrelation obtained from simulating 1.000 networks under different model specifications. Specifically, we fit four SIENA models to our data. First, a *control* model that includes autocorrelation at Wave 1, as well as the effects of structural (e.g., reciprocity, transitivity) and actor-level controls (e.g., sex, education). Second, a *selection* model that extends the control model and specifies homophily selection, but no social contagion processes. Third, a *contagion* model that specifies social contagion, but no homophily selection. Finally, we fit a *full* model including both homophily selection and social contagion effects (i.e., Model 1 as reported in Table 3). Fig. 1 illustrates the distribution of autocorrelation coefficients across specifications (see Panel A). Consistent with our main findings, mean network autocorrelation values for selection ($I_{\text{selection}} = 0.09$) and contagion ($I_{\text{contagion}} = 0.14$) demonstrate that both homophily selection and social contagion explain why socially connected entrepreneurs have more similar values of passion for founding. For context, these findings are comparable in magnitude with autocorrelation observed in friendship formation of adolescents based on academic achievements (e.g., Brouwer et al., 2022; Kretschmer et al., 2018; Pink et al., 2020), as well as alcohol use and smoking behavior (e.g., Mercken et al., 2009; Steglich et al., 2010).

[9] We acknowledge that SIENA is not yet natively equipped to calculate effect sizes in the sense readers are familiar with from linear regression (e.g., R^2). The approach we take here, following Steglich et al. (2010), is currently the only known workaround to address limitations related to SIENA's specification of separate evaluation functions for network and behavior change (Ripley et al., 2022), the use of unstandardized parameters, and typically strong interdependencies between network effects (Snijders, 2001).

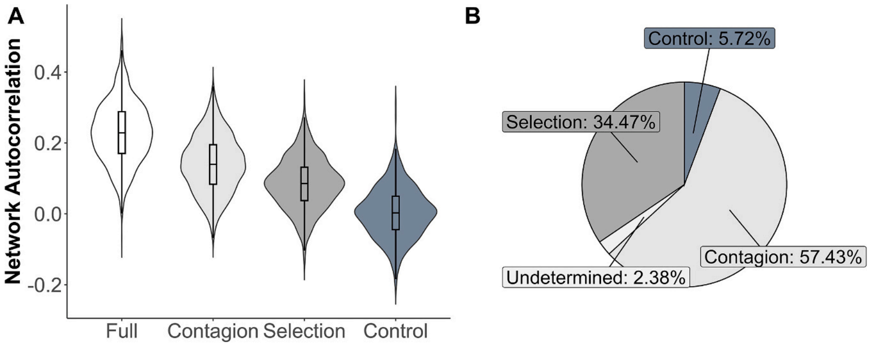


Fig. 1. Model-based decomposition of network autocorrelation. Violin plot of determined network autocorrelation across control, selection, contagion, and full model for passion for founding (Panel A). Pie chart showing the relative sizes of the differences between the average predictions of a control model and a full model, allocated through simulations to the respective co-evolution mechanism (Panel B).

To further facilitate interpretation, we follow prior work (e.g., Adams et al., 2022; Leszczensky and Pink, 2019) and convert autocorrelation values to percentages (see Fig. 1, Panel B). Because the control model is hierarchically nested within the full model, its relative contribution can be translated into percentages linearly (e.g., $I_{\text{control}}/I_{\text{full}}$). However, because the selection and the contagion model are nested in-between the control and the full model, but not within each other, their relative contribution can be determined in two ways. Either by looking at the decrease in network autocorrelation compared to the full model *or* by looking at the increase in network autocorrelation compared to the control model when including selection (or contagion respectively).[10] The difference between the two calculations is shown as "Undetermined" (e.g., $I_{\text{full}} - I_{\text{selection}} - I_{\text{contagion}} + I_{\text{control}}$) in the pie chart (see Steglich et al., 2010). Results show that social contagion plays a slightly larger role in the development of passion similarity (explaining around 57% of observed autocorrelation) while homophily selection is also an important contributor (explaining around 34% of observed autocorrelation).

6. Discussion

In this paper, we study the co-evolution of social networks and entrepreneurial passion. Using a stochastic actor-oriented model (SIENA) and four waves of panel data from a university-based startup accelerator program, we were able to disentangle homophily selection and social contagion of entrepreneurial passion while controlling for other individual attributes as well as structural network effects. We found support for our hypotheses concerning passion for founding: (1) similarity in passion levels drives tie formation among peer entrepreneurs; (2) high passion for founding is contagious among peer entrepreneurs; and (3) this passion contagion effect is stronger among co-founders than among other peer relationships. Surprisingly, we do not find support for these hypotheses for passion for inventing.

6.1. Theoretical contributions

The basic observation that socially connected individuals tend to share or have similar focal characteristics such as gender, age, or ethnicity is one of the most well studied effects in the social sciences overall (e.g., McPherson et al., 2001) and a robust finding in entrepreneurship research as well (e.g., Ruef et al., 2003). Rather than focusing once more on such surface level demographics, the similarity we address in this study is based on entrepreneurial passion (Cardon et al., 2009). The passion literature is indeed rife with demonstrations of how passion similarity (as opposed to diversity) between individuals is associated with positive outcomes, including entrepreneurial performance (e.g., de Mol et al., 2020), but less clarity exists about the underlying mechanism responsible for such similarity. For example, if we observe two connected entrepreneurs with similar passion at any point in time, how can this similarity be explained?

We first corroborate findings from a small but growing strand of passion literature that acknowledges passion's interindividual effects and has taught us that passion similarity is the outcome of a social contagion process (Hubner et al., 2020; Davis et al., 2017; Murnieks et al., 2016; Uy et al., 2021). We further extend this research that examined passion contagion from entrepreneurs to employees, investors, or team members, and show that passion spills over between peer entrepreneurs in an accelerator cohort, and that such contagion is bi-directional. This "network to passion" effect is important because it shows that peer entrepreneurs do not only constitute an important source of information, knowledge, and motivation (e.g., Chatterji et al., 2019; Hasan and Koning, 2019; Zuckerman and Sgourev, 2006), they are also an important source of entrepreneurial passion.

[10] We assume that the total (100%) of autocorrelation accounted for by our models equals the difference between predictions of the control model ($I_{\text{control}} = 0.00$) and the full model ($I_{\text{full}} = 0.23$). Thus, the relative contribution of autocorrelation attributable to contagion is the difference of Moran's I of the contagion and control model (which is nested within the contagion model) relative to the combined contribution of autocorrelation attributed to the selection, contagion, control, and "undetermined" mechanism.

Crucially, next to contagion, we show that passion similarity can be explained as the outcome of a selection process as well. Although secondary to social contagion in our data, homophily selection explains a significant amount (approximately 34%) of network autocorrelation. In other words, entrepreneurs in our sample also attracted and selected peers who had similar levels of passion (for founding) to begin with. This is not obvious because prior studies on passion contagion universally regard networks as static and do not capture who entrepreneurs interact with outside the boundaries of their experimental setting. For example, Hubner et al. (2020) "manipulate" the relationship under study by exposing potential employees to video pitches of passionate (versus less passionate) entrepreneurs, whereas Uy et al. (2021) look at passion convergence processes after teams have already been formed. What these studies currently overlook is that while passion scores change over time, social networks change too (Greve and Salaff, 2003; Patzelt et al., 2020). In contrast, our intensive longitudinal study captured these episodes of peer interactions and entrepreneurial passion dynamics over several months (Bergman and McMullen, 2022), allowing an estimation of the likelihood that self-selection determines observed passion similarity. Indeed, we find that entrepreneurs are more likely to send network ties to those whose levels of passion (for founding) are similar rather than dissimilar to their own. Such passion-based homophily selection (i.e., "passion to network") is valuable because identifying and understanding the criteria entrepreneurs actively select peers on is important to appropriately leverage social interactions between entrepreneurs across various social settings including accelerators, incubators, startup competitions, hackathons, and so on. For example, homophily selection based on passion matters, because accelerator design elements such as public pitches, shared progress meetings, or open workspaces (see Cohen et al., 2019) are shaped by "the social connections of entrepreneurs to other entrepreneurs" (Hallen et al., 2020: 397). Thus, passion similarity may be seen as a potentially important gateway to these resources and the effectiveness with which startup accelerators can facilitate a productive peer environment may partly hinge on the distribution of entrepreneurial passion among cohort peers.

Moreover, viewing selection and contagion mechanisms in concert has interesting implications for issues of endogeneity, whereby factors seen as causing a certain outcome are also partly dependent on the outcome (Borgatti and Halgin, 2011). We show, based on passion, that whenever networks and actor characteristics are dynamic and can occur in practice, researchers need to consider both selection and contagion to rule out alternative explanations (Steglich et al., 2006). For example, research on accelerators consistently finds that what happens during the acceleration period (i.e., program-specific effects such as mentoring, educational elements, or social events) affects startup performance (Assenova, 2020; Cohen et al., 2019). However, recent work also finds a significant reduction in the magnitude of these program-effects when controlling for cohort effects, suggesting that the initial selection of startups into an accelerator plays an important role in determining how successful these startups may become (Avnimelech et al., 2021).

Therefore, the implication of relaxing the assumption of initial passion dissimilarity (i.e., selection) is that strong contagion effects documented in past experimental research might be more modest in reality. For example, in the aforementioned Hubner et al. (2020) study, the authors artificially expose participants (i.e., egos) to more or less passionate entrepreneurs (i.e., alters) and show stronger contagion effects if initial dissimilarity between ego and alter is higher. The authors carefully note that "a more detailed analysis of the (self-) selection mechanisms in future research could provide a better understanding (…) on the possibilities for contagion" (Hubner et al., 2020: 1133). Responding to this call for research, our more detailed analysis of selection mechanisms suggests that passion dissimilarity as a starting point for contagion is far less realistic, because homophily selection on passion makes large initial differences in passion less likely (see Section 5.2.2.1 for a numeric example).

Finally, homophily selection and social contagion of passion for founding, as well as the absence of these in passion for inventing, positions entrepreneurial passion as an important variable for consideration in studies on entrepreneurial teams (e.g., Lazar et al., 2020; Patzelt et al., 2020; Ruef et al., 2003). Here, our findings that teams are a critical vector for the transmission of entrepreneurial passion echo prominent warnings that "entrepreneurs may want to think about the passions of those whom they invite to join the [new venture team]" (Cardon et al., 2017: 299). However, much of the literature about entrepreneurial teams tends to treat team configurations as exogenous or predetermined so that characteristics of its members may be used as a starting point while staying "largely silent on how teams are formed in the first place" (Lazar et al., 2020: 51). Our findings are therefore relevant to the formation strand of the entrepreneurial team literature which posits that, entrepreneurs can select co-founders based on similarity-attraction or resource-seeking strategies (Lazar et al., 2022). Whereas similarity-attraction suggests a supplementary fit as co-founders select each other because they share similar attributes (Ruef et al., 2003) and return the sentiment of liking (Byrne, 1971), resource-seeking means co-founders are complementary as they are selected based on the knowledge, skills, and capabilities (i.e., resources) necessary for the creation of a new venture (Davidsson and Honig, 2003; Mosey and Wright, 2007). We add entrepreneurial passion to this conversation about how teams are formed. Specifically, we find that while passion for founding can act as an attractor and then organically "grow" through social contact with other passionate founders, passion for inventing might have to be purposefully selected for when forming a team.

6.2. Practical implications

An array of entrepreneurial actors and programs including investors, accelerators, and incubators aim to facilitate startups and improve their performance (Cohen and Hochberg, 2014). To do so, they invest significant resources in selecting, building, and maintaining entrepreneurial teams as well as the creation of a supportive peer environment (Cohen et al., 2019). By demonstrating that passion for founding is contagious, we position this passion domain as a potential quality differentiator between those programs. To the extent that passion for founding captures the desire to acquire resources and ultimately found a new venture, social contact with other entrepreneurs might not only provide the tools and knowledge to create a new venture, but also make the founding process more motivating and enjoyable. Therefore, our findings might help explain why some accelerators, such as the prestigious Y Combinator program, stimulate broader peer network formation by organizing informal events such as weekly dinners for all the entrepreneurs in the cohort (van Rijnsoever, 2020; Combinator, 2005). Program managers would do well to organize events where (highly) passionate entrepreneurs in the cohort could demonstrate their passion (for founding) to their peers, for example by pitching their startup or sharing more general (positive) experiences of being an entrepreneur.

6.3. Limitations and future research

Although the accelerator program we studied provides an exceptional research setting and controls for potential structural and actor-level differences of participating entrepreneurs, it nevertheless has its own peculiarities that may have influenced the generalizability of the results.

First, we cannot rule out that participants were in contact with other entrepreneurs outside the boundaries of the accelerator program we studied such as former cohort members, guest speakers, mentors, or entrepreneurial parents (Hallen et al., 2020; Eesley and Wang, 2017), all of whom may have influenced their level of entrepreneurial passion. Still, if anything, the fact that we can identify the hypothesized effects despite potential unobservables is encouraging and renders our results more conservative.

Second, we investigate passion of entrepreneurs with startups at the conception stage (Fisher et al., 2016). While recent work goes so far as to suggest that passion domains could be safely aggregated to predict relevant entrepreneurial outcomes (Zhao and Liu, 2022), we find that differences between passion domains matter in our context. Passion for founding is both a driver of network tie formation and socially contagious among entrepreneurs, whereas similar effects for passion for inventing were not observed in our sample. Although speculative, it seems plausible that the accelerator program under study, with its focus on founding-related activities (Cohen and Hochberg, 2014), might have primed entrepreneurs' founder identities as the most salient to "push down" the inventor identity in the hierarchy of role identities (Murnieks et al., 2014; Powell and Baker, 2014). In addition, passion for inventing could have unfolded "behind the scenes," because several startup teams in our sample were working toward digital products and services (e.g., digital solutions, software as a service etc.) rather than tangible, physical objects for which invention activities are more observable to peers. This calls attention to social context as an important, yet underexplored, boundary condition that either affords or hinders the relevance of passion for founding versus passion for inventing. Future research might examine whether a) early-stage incubators that focus strongly on "inventing" activities (Mian, 1997) or b) interstitial spaces such as the "Homebrew Computer Club"—which both include collective experimentation in close proximity to others (Furnari, 2014)—stimulate an inventor identity. Similarly, future research might examine later stage scale-up programs, with their focus on growth (cf. Mathias and Williams, 2018), which may be more likely to elicit an entrepreneur's "developing" identity.

Third, our theorizing was centered around passion as positive emotion. However, homophily selection and social contagion based on passion between peers in accelerator programs might also have a darker side if cohorts become socially stratified based on role identities and passion levels. According to Burke and Reitzes (1991), people not only seek out activities consistent with their salient role identity, they also refrain from engaging in activities that are inconsistent and therefore distract from that salient identity. Therefore, a salient role identity will motivate entrepreneurs to favor certain activities, creating more opportunity to connect with likeminded others. This possibility invites future research on accelerator cohort dynamics (e.g., Yu, 2020). In addition, similar to more positive manifestations of entrepreneurial passion, obsessive forms of passion might also be contagious. Obsessive passion has been shown to affect psychological well-being, leading to stress and causing work-life conflict as entrepreneurs lose conscious control over their engagement in entrepreneurial activity (Vallerand, 2008, 2012). Obsessive engrossment in entrepreneurial activity may take up disproportionate amounts of time at the cost of other activities, and create interpersonal pressure compelling others to engage in similar behavior (cf. Vallerand et al., 2007). Perhaps future research could follow this line of reasoning, and begin to explain why entrepreneurs in accelerator programs find themselves: "often working seven days a week, doing little else but work and sleep" (Cohen and Hochberg, 2014: 10).

7. Conclusion

We study social contagion of entrepreneurial passion between peer entrepreneurs in an accelerator cohort while controlling for (homophily) selection effects and other social network dynamics. A better understanding of the social dynamics of entrepreneurial passion is crucial, given passion's impact on individual, team, and venture level outcomes. Our findings are promising, as they point to the potential passion for founding (but not inventing) has to steer the formation of peer ties as well as be transferred from one entrepreneur to another across these ties. In other words, when peer entrepreneurs show passion similarity, both selection and contagion effects are likely at play.

CRediT authorship contribution statement

Conception and design of study: K. Becker, J.J. Ebbers, Y. Engel.
acquisition of data: K. Becker, J.J. Ebbers, Y. Engel
analysis and/or interpretation of data: K. Becker, J.J. Ebbers, Y. Engel.
Drafting the manuscript: K. Becker, J.J. Ebbers, Y. Engel
revising the manuscript critically for important intellectual content: K. Becker, J.J. Ebbers, Y. Engel.

Data availability

Data will be made available on request.

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Appendix A. Sample characteristics

	Wave			
Variables	One	Two	Three	Four
Demographics/controls				
Name	×	×	×	×
Startup Name		×	×	×
Age	×			
Sex	×			
Education	×			
Entrepreneurial experience	×			
IV, DV				
Entrepreneurial passion				
for founding	×	×	×	×
for inventing	×	×	×	×
Name generator (network)	×	×	×	×
Sample/Network				
Response rate[a]	95.51%	88.76%	96.63%	83.15%
Data collection	Baseline Early September (Pre-program)	Start Mid October (Teams formed)	Midpoint Late November	End Late January (Demo day)
Entrepreneurial passion				
Founding	17.57 (5.55)	18.38 (5.79)	17.50 (6.43)	16.35 (6.55)
Founding (rescaled)	3.74 (0.97)	3.87 (0.94)	3.73 (1.11)	3.54 (1.13)
Correlation	0.98	0.98	0.98	0.98
Inventing	19.21 (4.76)	18.25 (5.55)	18.36 (5.08)	17.47 (5.37)
Inventing (rescaled)	4.08 (0.82)	3.95 (0.93)	3.94 (0.87)	3.81 (0.92)
Correlation	0.97	0.97	0.96	0.96

Note: SIENA relies on categorical variables to model changes in behavior (i.e., passion). We range transformed passion scores: $z_{new} = \frac{(Z_{old} - 1)(new\ scale_{max} - new\ scale_{min})}{(old\ scale_{max} - old\ scale_{min})} + 1$. Rescaled scores were rounded to the closest integer number (see lower panel). For instance, a high (low) passionate entrepreneur with a score of 23.75 (6.75) would have her score transformed to $z_{new} = \frac{(23.75 - 1)(5 - 1)}{(25 - 1)} + 1 = 4.79\ (1.96)$ which would be rounded to 5 (2).

Appendix B. Simulation investigation for empirical network analysis (Siena) – overview

Effect, short name in SIENA manual, and formula	Effect definition:
Structural network effects (controls)	The tendency…
Outdegree: density $s_1(x) = \Sigma_j x_{ij}$	… to form and maintain ties in general. This can be regarded as an intercept.
Reciprocity: recip $s_2(x) = \Sigma_j x_{ij} x_{ji}$	… to reciprocate ties. This is represented by the number of reciprocated ties (measure of mutuality).
Transitivity: gwespFF $s_3(x) = \Sigma_{j=1}^{n} x_{ij} e^{\alpha} \left\{ 1 - (1 - e^{-\alpha})^{\Sigma_{h=1}^{n} x_{ih} x_{hi}} \right\}$	… to form and maintain network ties to "friends of friends". This is represented by the number of shared connections *h* of a directed tie *i* to *j* (triad closure).
Indegree alter: inPop $s_4(x) = \Sigma_j x_{ij} x_{+j}$	… to attach to actors with high indegrees.
Outdegree alter: outPop $s_5(x) = \Sigma_j x_{ij} x_{j+}$	… to connect with entrepreneurs that nominate many others as ties.
Outdegree ego: outAct $s_6(x) = \Sigma_j x_{ij} x_{i+}$	… of entrepreneurs with many outgoing ties to nominate more entrepreneurs as tie.

(*continued on next page*)

(*continued*)

Effect, short name in SIENA manual, and formula	Effect definition:
Covariate and passion effects	
Alter: altX $s_{7a}(x) = \Sigma_j x_{ij} v_j$	… to form ties with entrepreneurs with high values in that covariate. This can be regarded as covariate-related popularity effect.
Alter²: altSqX $s_{7b}(x) = \Sigma_j x_{ij} v_j^2$ (continuous covariates)	
Ego: egoX $s_{8a}(x) = \Sigma_j x_{ij} v_i$	… of entrepreneurs with high values in a covariate to nominate more ties than entrepreneurs with low values in a covariate.
Ego²: egoSqX $s_{8b}(x) = \Sigma_j x_{ij} v_i^2$ (continuous covariates)	
Same: sameX $s_{9a}(x) = \Sigma_j x_{ij} I\{v_i = v_j\}$	… of entrepreneurs to tie to similar others. This represents the number of ties of *i* to all other entrepreneurs *j* who have exactly the same covariate value (e.g., sex).
H1 Homophily: diffSqX $s_{9b}(x) = \Sigma_j x_{ij} (v_i - v_j)^2$ (continuous covariates)	… of entrepreneurs to tie to others with similar levels of a continuous covariate (e.g., passion). This is represented as the squared alter-minus-ego difference of the covariate over all entrepreneurs to whom *i* has a tie.
Contagion effects	
H2 Contagion: avAlt $s_{10a}(x) = z_i(\Sigma_j x_{ij} z_j)/(\Sigma_i x_{ij})$	… of entrepreneurs to have high entrepreneurial passion if tied to alters who have higher values of passion on average.
H3 Weighted contagion: avAltW $s_{10b}(x) = z_i(\Sigma_j x_{ij} w_{ij} z_j)/\Sigma_i w_{ij} x_{ij}$	… of entrepreneurs to have high entrepreneurial passion if tied to alters on the same startup team who have higher values of passion on average.
Network autocorrelation	
Moran's $I = \mathrm{n}\, \Sigma_{ij} x_{ij}(z_i - \bar{z})(z_j - \bar{z}) / (\Sigma_{ij} x_{ij}) \left(\Sigma_i (z_i - \bar{z})^2\right)$	… of network ties to cluster based on similarity in passion.

Note: The used effects $s_i(x)$ are numbered 1–10. $x_{ij} = 1$ indicates presence of a tie from entrepreneur *i* to *j*, while $x_{ij} = 0$ indicates absence of this tie. x_{+j} (x_{j+}) refers to all incoming (outgoing) ties of entrepreneur *j*. v_i (v_j) represents Ego's (Alter's) value of a covariate in the network selection part of the model. z_i (z_j) represents Ego's (Alter's) passion score in the social contagion part of the model. In effect 9a, the indicator function *I* equals 1 if ego and alter of a tie are of the same covariate value (e.g., sex); 0 otherwise. In effect 10b, $w_{ij} = 1$ indicates that both entrepreneurs are on the same startup team. For additional information as well as a detailed derivation and technical implementation of all effects, we refer to Ripley et al. (2022). For a practical example including effect interpretation, we refer to Steglich et al. (2010).

Appendix C. Robustness testing

We draw on specification curve analysis (Simonsohn et al., 2020), to test the robustness of our main findings. Specification curve analysis graphically displays the results of our main effects (i.e., homophily selection and social contagion at cohort and team level) across various non-redundant theoretically justified and statistically valid SIENA models (Fig. C.1). All robustness models were gradually built to include more complex specifications while maintaining sufficient model convergence and data fit (Ripley et al., 2022). Homophily and contagion effects were significant at conventional levels across all 22 specifications. We note that homophily selection effects under Models 2, 4, 7, and 20 were significant at the $p < .10$ rather than at $p < .05$ level, likely because these specifications did not include key attributes for homophily selection such as shared sex or education background (McPherson et al., 2001).

Model 1 contains all structural network controls as described in Section 5.2.1 including outdegree-, reciprocity-, and transitivity effects, their interaction, as well as degree-related effects and the startup team membership yet no other actor attributes aside from entrepreneurial passion for founding and inventing, respectively. This is akin to a baseline model in regression without control variables. Models 2–16 gradually introduce actor level covariates (controls) including entrepreneurs' age, sex, education, and experience as well as combinations of these. Model 16 incorporates all structural network controls and actor covariates and represents the main model reported in the results section (Table 3). Models 17–19 are akin the main model but remove four entrepreneurs for which we imputed missing age and entrepreneurial experience data. Model 20–21 test for the robustness of our scale transformation (see Appendix A) by using a 1–7 (Model 20) and 1–9 passion scale (Model 21), respectively. Model 22–23 control for entrepreneurial performance (Uy et al., 2021). Entrepreneurs who invest more effort and perform better are more likely to develop and maintain high levels of passion (Gielnik et al., 2015; Lex et al., 2020). Therefore, we included revenue data – which we obtained after the official end of the program – as an ego covariate (control) in the behavioral part of the model. Controlling for revenue (Model 22) and revenue squared (Model 23) did not alter our main effects in any meaningful way. We note here that because revenue was assessed at the level of the team and not measured throughout the program but captured only at its end point, it is inconsistent with the nature of our actor-oriented model and was therefore not included in its main specification. Model 24 controls for previous ties (Hasan and Koning, 2019) and mitigates potential concerns that Wave 1 is exogenous to homophily and contagion effects, as we obtained network and passion data in a baseline survey before the actual start of the program.

Finally, we also specified different contagion mechanisms such as the average similarity (avSim), the total alter (totAlt), and the total similarity (totSim) effect. Unlike *average* effects, *total* effects indicate that contagion is proportional to the number of alters and were therefore specified at the cohort level. In contrast to *alter* effects expressing that actors whose alters have a higher total value of the behavior *Z*, also have themselves a stronger tendency toward high values on the behavior, *similarity* effects indicate convergence to "meet in the middle" (Ripley et al., 2022). In line with our theorizing, passion (for founding) spills over from high passionate cohort peers (e.g., Model 1 – *totAlt*: 0.131; $\chi^2(1) = 6.04$; $p = .014$) but does not converge (e.g., Model 1 – *totSim*: −0.042; $p = .878$). In line with prior research (Uy et al., 2021), passion also convergences among entrepreneurs on the same startup team (e.g., Model 2 – avSim: 1.862; $\chi^2(1) = 5.45$; $p = .020$).

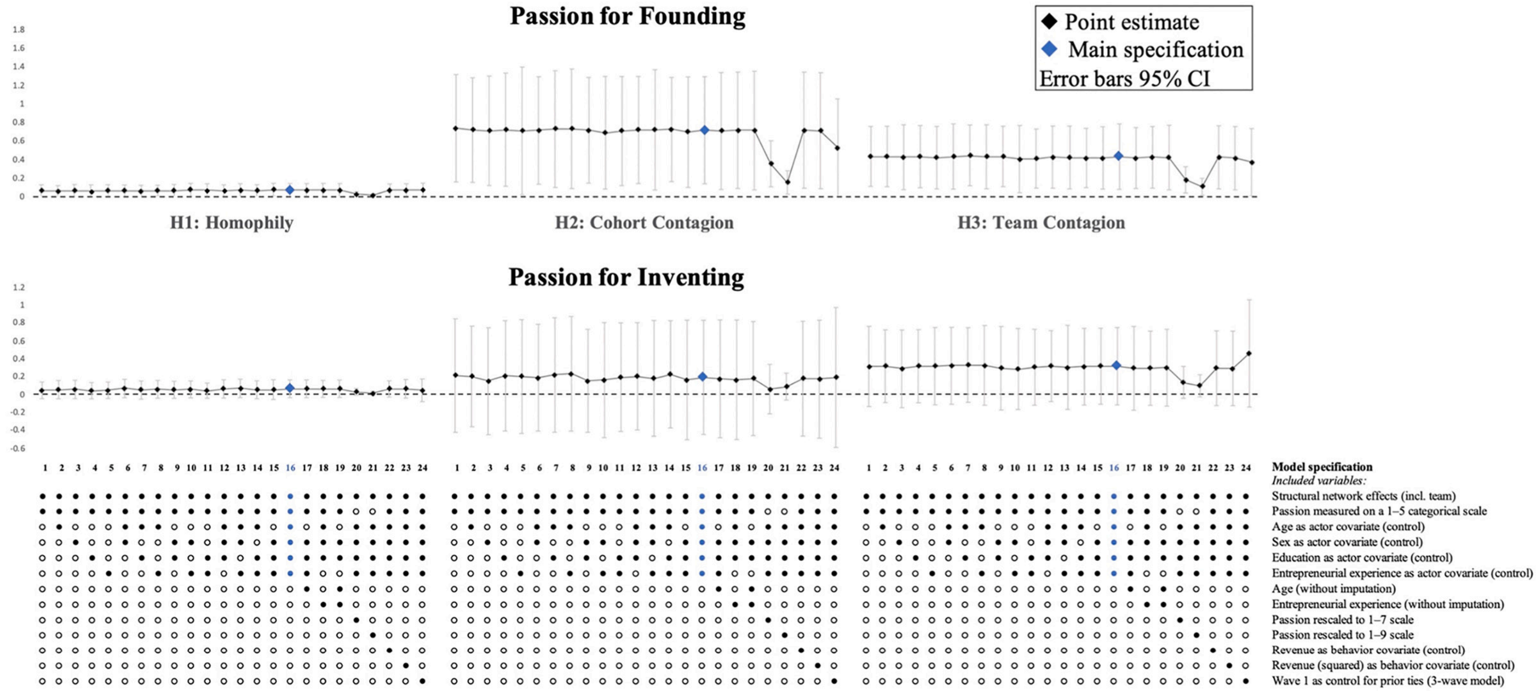

Fig. C.1. Robustness tests.

Note: Fig. C.1 demonstrates homophily selection, contagion, and team contagion estimates across different model specifications. SIENA measures homophily as squared differences indicated by a negative coefficient that was inverted to represent similarity and fit with the visualization (Schaefer and Kreager, 2020). Models are gradually built according to the legend in the lower half. For example, Model specification 1 incorporates only data on entrepreneurial passion as well *structural network effects* including *team membership*. Model 16, which is the Main Model used in our manuscript, extends by including actor level covariates age, sex, education, and experience as controls.

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