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Structural Role Complementarity in Entrepreneurial Teams

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Abstract. To refine the understanding of the social network characteristics of entrepreneurial teams, we present a new construct: structural role complementarity. In particular, we examine the variation between team members' respective abilities to act as network brokers. Based on the cofounding networks of 9,461 entrepreneurs and 2,446 large-scale industrial enterprises over 45 years in Russia's emerging economy (1869–1913), our findings show that variation among team members' brokering ability significantly predicts the starting capital raised by their firm. The effect is moderated by the team's average brokering potential. When both the team's average and variation in brokering potential is high, firms raise greater starting capital. By using multiple membership models, we demonstrate that greater starting capital is largely attributable to team factors rather than the attributes of the individual team members. We also take advantage of discriminatory laws that were passed in 1887 in an instrumental variable analysis to address potential endogeneity issues.

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Keywords: social networks • structural roles • entrepreneurial teams • emerging economies

Introduction

Entrepreneurship requires an array of knowledge and skills, as well as social connections to various groups that may not be solely accessible to a lone entrepreneur (Aldrich and Kim 2007, Ruef 2010). When teams of entrepreneurs found new firms, it is often the diversity of experience among those founders that underlies the new firm's success (Beckman et al. 2007, Ruef et al. 2003). The literature on the social capital of teams suggests that for internally cohesive teams, the benefit of compositional diversity partly stems from the range of different ties that each member has external to the team, which provide access to valuable resources and information (Oh et al. 2004, Reagans et al. 2004). Yet, at the same time, economic sociologists observe that cohesion among a team's external relations also provides unique benefits important to these entrepreneurial teams, such as joint problem solving, increased trust, and improved knowledge sharing (Ahuja 2000, Aldrich and Zimmer 1986, Uzzi 1997, Vedres and Stark 2010). We argue that these seemingly inconsistent findings arise in part from the attribution of social relations to firms rather than to the individual entrepreneurs who direct these firms (Sorenson and Rogan 2014). Instead, we propose *structural role complementarity* as a means unique to teams where individual members "specialize" in structural roles, allowing entrepreneurial teams to profit from brokering ties while simultaneously retaining the advantages of ties to a cohesive group.

For individual entrepreneurs, it is rarely possible to fully retain the benefits of the social capital derived from ties to a cohesive group while attempting to broker beyond that cohesive group (Hillmann 2008). The mechanisms of group cohesion and norm enforcement that provide social capital benefits to entrepreneurs also act to discourage relations to non-group members (Coleman 1988). When an entrepreneur connects to non-group members, it tends to weaken the ability of partners within the group to evaluate his business dealings and to sanction him effectively (Portes and Sensenbrenner 1993, Shipilov and Li 2008). Hence, as the entrepreneur embedded in a cohesive group begins to benefit from brokerage connections, it may also threaten his "good standing" in the group. However, entrepreneurial teams need not make this social capital trade-off between cohesive ties versus brokering ties because entrepreneurial ties belong to founders, not firms. Drawing on the sociological concept of structural roles (White 2001), we argue that the pattern of

relationships that each entrepreneur maintains is specific to the individual team member, and differentiates them into a distinct role within the team. Thus, collectively, entrepreneurial teams may simultaneously realize the full benefits of both brokerage and cohesive ties without incurring the trade-off faced by an individual entrepreneur who attempts both roles.

We assess our argument using a data set uniquely suited to investigate the networks of entrepreneurial teams—namely, data on the chartering of all joint-stock and share partnership firms in Russia between 1869 and 1913. Comprised of state-mandated founding charters for 2,446 firms formed by entrepreneurial teams, this data set provides not only detailed descriptives for the firm, such as the firm's industry and region, but also key characteristics of the 9,461 associated founders, such as founder ethnicity. Similar to modern founding of firms, the majority of all new ventures in our setting (65% of the 3,762 new firms) were established by a team of two or more entrepreneurs (Aldrich and Kim 2007, Ruef et al. 2003). To examine how structural role complementarity contributes to firm success, we model the basic starting capital raised by the firm, a critical event in the entrepreneurial process that is documented in the charters (Beckman et al. 2007, Hillmann and Aven 2011, Stuart and Sorenson 2003).

These historical data permit us to examine the relational patterns of founding teams in the context of an emerging economy with detailed longitudinal data on both individuals and firms; comparable data are rarely available for analogous contemporary settings. Emerging economies currently account for 58% of the world's gross domestic product measured in purchasing power parity, as reported by the International Monetary Fund's (2016) *World Economic Outlook*. In contrast to established economies, emerging economies are characterized by high institutional uncertainty and limited access to capital resources (Hillmann and Aven 2011, Khanna and Rivkin 2006, Nee and Opper 2012). These conditions accentuate the value of reliable information acquired via social networks (Eisenhardt and Schoonhoven 1990), and our data on Russian entrepreneurial teams provide a unique opportunity to assess the importance of these networks on the success of new firms in emerging economies.

Although teams of founders initiate a large portion of entrepreneurial ventures (Aldrich and Kim 2007, Ruef et al. 2003), the study of founding teams poses methodological challenges. In particular, our data include founders who join multiple entrepreneurial teams over the 45-year study period, and the success of teams is potentially attributable to the characteristics or skills of these individual serial founders. However, our dependent variable of basic capital raised is specific to entrepreneurial teams, not individuals, and furthermore, only 1.5% of the entrepreneurial teams in this sample are comprised of the same set of unique founders. These considerations preclude the use of conventional fixed effects to assess the extent to which unobserved heterogeneity across team members, such as their talent for entrepreneurship, drives capital mobilization. We therefore use multiple membership models with weighted random effects to account for the nonindependence that stems from the repeated observations of serial founders and the cross-sectional outcome. These models provide more conservative estimates than the corresponding GLM estimates while also offering insight into the extent to which variance in entrepreneurial capital is attributable to individual founders. Next, to address potential endogeneity concerns with cross-sectional data, such as reverse causation or omitted variables, we take advantage of discriminatory laws that were passed in 1887 in an instrumental variable (IV) analysis. These laws excluded Jews and foreigners from the potential set of founding team members for certain regions and industries. Therefore, these laws affect our independent variable, a measure of the diversity of brokerage roles among team members, but not our dependent variable of capital raised by founding teams, making them well suited for use as an instrument.

Brokerage and Cohesion in Entrepreneurship

Social relations, particularly to other founders, provide access to relevant market information, resources, and social support, which in turn greatly enhance new firm outcomes (Hillmann and Aven 2011, Khanna and Rivkin 2006, Stuart et al. 1999, Vedres and Stark 2010). In particular, social network ties have been found to help new firms and entrepreneurs access financial capital (Aldrich and Zimmer 1986, Portes and Sensenbrenner 1993); permit admission to supporting institutions, such as professional service organizations (Freeman 1999); and facilitate the identification of entrepreneurial opportunities (Stuart and Sorenson 2005). In sum, the individual founders' relations to other founders beyond the focal team provide crucial channels for resource mobilization.

Mobilization of resources presents a critical twofold challenge for entrepreneurs, and the lack of institutional support common to emerging economies only serves to accentuate these challenges (Marquis and Raynard 2015). First, founders must search for potential resources such as investors with capital, employees with the appropriate skills, banks able to provide financing, and suppliers willing to extend credit. Once the founders have identified potential resources, they next must mobilize them by, for instance, convincing investors to invest in the firm and prospective

employees to join the firm. Emerging economies' characteristic lack of economic institutions and infrastructure that promote and regulate markets hinders both the search for available resources and the trust necessary to mobilize resources (Hillmann and Aven 2011, Khanna and Rivkin 2006, Nee and Opper 2012).

On the one hand, founders who act as brokers can locate resources and opportunities in the market, such as potential investors with capital, skilled labor, and potential suppliers or distributors (Burt 2005, Ferriani et al. 2009, Stuart et al. 1999, Stuart and Sorenson 2005). Since their network ties connect them to an array of disparate parties, brokers often have valuable information about suppliers, customers, and competitors (Vedres and Stark 2010). In essence, brokers benefit the team largely by capturing novel market information, which then enhances the identification of necessary material resources (Ahuja 2000). Also, brokers have the added capability of bridging competing parties, which can produce financial advantages in negotiations, such as obtaining favorable terms from investors (Burt 1992, Pfeffer and Salancik 1978). While the broker's diverse and disconnected relations facilitate the search for available resources, the mobilization of these resources is likely to be difficult and time consuming.

On the other hand, founders with relationships to contacts who are densely connected benefit in that their connections are characterized by high trust and a greater motivation to cooperate (Ahuja 2000, Coleman 1988, Granovetter 1985, Oh et al. 2004, Shipilov and Li 2008). In turn, this trust and cooperation enable these founders to quickly marshal resources, especially under uncertain conditions (Aldrich and Zimmer 1986, Krackhardt 1999, Portes and Sensenbrenner 1993). Direct and indirect relations to a founder enhance the access to credible information about the founder, which helps overcome the uncertainty of potential investors and prospective employees (Dahl and Sorenson 2012, Ruef et al. 2003, Sorenson and Stuart 2001). Moreover, their nonbrokering relations facilitate both joint problem solving and the exchange of private or tacit information, which are critical in the early stages of an enterprise (Hansen 1999, Uzzi 1997). Rather than simply being transactional, these early investors and employees will attempt to find mutually beneficial solutions if the entrepreneur experiences operational difficulties or financial setbacks (Uzzi and Gillespie 2002). Finally, connections within a cohesive group can guard individual entrepreneurs against economic fraud by facilitating collective sanctioning of opportunism (Coleman 1988, Granovetter 1985). These forms of social safeguards often act as private-order substitutes for absent or weak regulatory institutions (Marquis and Raynard 2015). By way of an example from economic history, the Maghribi trader coalition illustrates how close-knit networks enabled the sanctioning of opportunistic behavior by excluding offenders from any future business with all members of the coalition (Greif 2006). Hence, although founders connected only to a cohesive group may have a limited ability to search for resources throughout the market, the resources they already have at their disposal may be more readily mobilized via their connections.

Nonetheless, the social capital benefits brought about by membership in a cohesive group may be undermined if the individual entrepreneur seeks to create ties beyond the group in which he is heavily embedded. Highlighting the double-edged sword of the social capital generated from group cohesion, Portes and Sensenbrenner (1993) point out that the solidarity and norm enforcement that group cohesion facilitates can also act to restrict ties to individuals outside of group. Moreover, dense ties within a group coincide with a strong social identity, which often leads these group members to negatively stereotype and be suspicious of non-group members (Sherif et al. 1961, Rao et al. 2000). Affiliations beyond the cohesive group make an entrepreneur's membership in that group less certain, and ambivalence arises toward the entrepreneur because the group members question his commitment to the group (Krackhardt 1999, Popielarz and McPherson 1995, Portes and Sensenbrenner 1993). When there is a strong in-group orientation, a single member's attempts to broker or create external connections beyond the group can consequently undermine the group's trust and motivation to provide support to that member (Hillmann 2008, Shipilov and Li 2008, Xiao and Tsui 2007). Thus, we argue that when individual entrepreneurs tied to cohesive groups attempt brokering successive connections beyond the group, it can reduce their social capital within that group and perhaps jeopardize it altogether.

This is not to suggest that the relationship of social capital and the proportion of in-group ties to out-group ties is linear and static for an individual founder. A one-time founding beyond the cohesive group will probably not entirely compromise an individual founder's standing, but each additional external connection potentially erodes it in a gradual manner (Portes and Sensenbrenner 1993). Therefore, it would not behoove these founders to attempt to become brokers themselves; instead, they should partner with one.

Clearly, both brokering ties and ties to a cohesive group can foster the success of an entrepreneurial endeavor, but through very different means. Consider as an example an early-stage firm without capital backing, which presents the greatest risk to investors. These early investments are generally perceived to be riskier largely because the firm has not yet been vetted by other investors, and it is uncertain whether there will be subsequent investors who support the new firm (Eisenhardt and Schoonhoven 1990, Thornton 1999).

Faced with this liability of newness, the nonbroker entrepreneur, embedded as he is in a tightly knit web of connections, may rely on the reservoir of trust that these ties provide to mobilize initial seed money. But in this case, the small group of cohesive founders may not have sufficient capital to fully fund the firm. This is a situation where a broker can then leverage his diverse ties to recruit the additional investors needed, a task made easier given the early set of investors. Hence, the complementarity of structural roles provides a potent means for the members of an entrepreneurial team to circumvent trade-offs and benefit from both brokerage and cohesion.

Structural Role Complementarity

Previous research on networked teams has primarily considered the external contacts that each individual member contributes to the team collectively (Ferriani et al. 2009, Hansen 1999, Oh et al. 2004, Reagans et al. 2004, Uzzi and Spiro 2005). These earlier studies frame a team's relational characteristics as either external (ties beyond the focal team) or internal (ties within the team), and then examine the trade-off between the benefits of strong and dense connections—cohesion—versus the advantages of bridging connections—brokerage—for the team. For example, prior research indicates that performance benefits from coupling high internal cohesion among team members with ties external to the team that bridge disconnected others (Oh et al. 2004, Reagans et al. 2004). Uzzi and Spiro (2005) focus exclusively on the effect of teams' external ties (past team affiliations) and find that triadic closure based on all of the members' external connections increases success, but only up to a point. Vedres and Stark (2010) introduce a somewhat different concept for team networks (structural folds) to capture the degree to which team members are embedded within multiple teams, and they find that this overlap significantly improves the team's outcomes. Taken together, this earlier research highlights that when examining the effects of networks and teams, there are simultaneous internal and external dynamics that affect the performance of the team. Our concept—structural role complementarity—extends this stream of literature by integrating external connections with the team's internal role composition.

Implicitly, these prior studies have assumed that social relationships are transferrable among team members and therefore can be aggregated to the team level. This team-level aggregation not only leads to the loss of detail but also obscures how individual members vary in their brokerage ability (Vedres and Stark 2010). Sorenson and Rogan (2014) argue, however, that the social connections of the individual members should not necessarily be attributed directly to the entrepreneurial firm, and that social ties are more commonly "owned" by individuals rather than the firm. In other words, entrepreneurs in a team can employ their social ties in the service of the firm, but the relationships are created, cultivated, and maintained by the individual entrepreneurs. Attributing these external relationships specifically to the individual team members permits an enhanced understanding of the uses of social capital within founding teams. In particular, we can apply the concept of structural roles to the entrepreneurial team members and categorize each individual by the characteristics of their networks (White 2001, White et al. 1976). Structural roles can be understood as reflecting equivalence in the general pattern of relationships that entrepreneurs maintain, but this does not imply that two entrepreneurs who share such roles (1) are directly connected to each other or (2) that they are connected to exactly the same set of other entrepreneurs. Our understanding of roles is therefore closer to the concept of regular equivalence than to the strict concept of structural equivalence (Everett and Borgatti 1994, Faust 1988, Winship and Mandel 1983). Thus, individual members on an entrepreneurial team may be distinguishable from each other by their different structural roles.

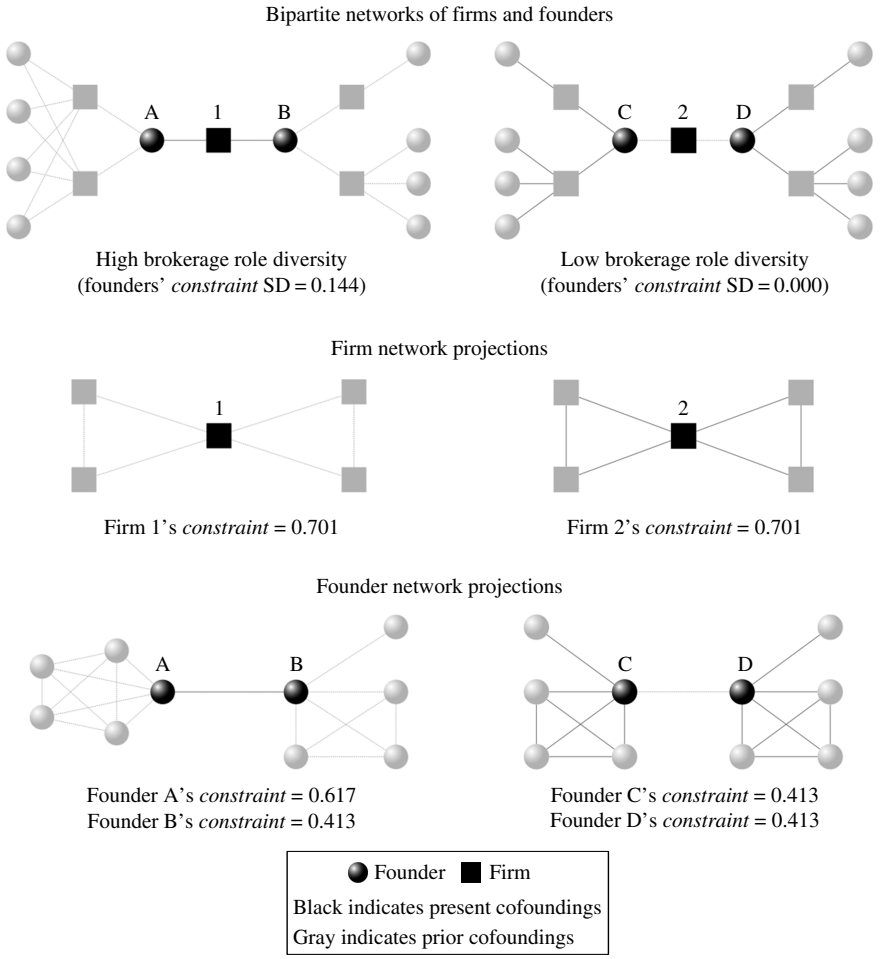
The literature suggests that team outcomes and processes improve when members play different functional roles based on their particular knowledge or skills (Beckman 2006, Beckman and Burton 2008, Bunderson 2003). In particular, these roles permit team members to divide the required activities effectively among the team as well as "play to each member's strength" (Ancona and Caldwell 1992). For example, team members with strong social or language skills may emerge as the team's communication specialist, or inspirational members may become the informal team leader. This role differentiation can help the team to develop greater skills, abilities, and knowledge, and when the roles are complementary, it has been linked to greater entrepreneurial performance (Beckman 2006, Beckman and Burton 2008, Eisenhardt and Schoonhoven 1990, Ruef et al. 2003).

Given the complementary benefits of brokerage and cohesion for entrepreneurship, we focus on the brokerage and nonbrokerage roles within a team. Similar to functional roles, differentiation into structural roles permits team members to specialize in complementary activities, such as maintaining brokerage relations or cohesive relations.[1] Moreover, the potential trade-offs that an individual might experience between brokerage and cohesive relations need not hinder a team in which members specialize across these different but beneficial structural roles. Although it has not been examined in the team context, we predict that *brokerage role diversity* as a specific and particularly important case of structural role complementarity will

enhance entrepreneurial teams' functioning and outcomes. While we specifically focus on brokerage role diversity because of its significance for entrepreneurial success, other contexts, such as project teams in organizations, might benefit from other forms of structural role complementarity, such as member-level diversity in the number of external connections or the average path distance to non-team members.

A focus on the networks and roles of individual founders reveals variation in brokerage that is not necessarily evident when examining only firm-level networks. To illustrate this point, consider the stylized comparison of two firms and their respective founders in Figure 1. The two panels on either side of the figure show networks for two different firms and their founders—one with high and the other with low brokerage role diversity. The focal Firms 1 and 2 with their respective founders (A and B; C and D) are highlighted in black at time t, and the surrounding founders and firms depicted in gray represent previous cofoundings at time $t - n$. Vertically, the right and left panels depict the affiliations among these two firms and their founders represented in three different manners: the firm-founder bipartite network, the firm network projections, and the founder network projections. The first images of the bipartite networks of Firm 1 and Firm 2 depict two founders who each have two prior foundings. The second images for Firm 1 and Firm 2 in the panels are the conventional one-mode projections of the firm-to-firm networks, where firms are connected via shared founders. As shown, both Firm 1

Figure 1. Stylized Networks for Two Different Firms (Firm 1 and Firm 2) and Their Two Respective Founders (Founders A and B and Founders C and D)



Notes. The contemporary founders and firms are highlighted in black, and each founder's past cofoundings are presented in gray. The left-hand panel presents Firm 1, which has high *brokerage role diversity*, whereas the right-hand panel presents Firm 2, which has low *brokerage role diversity*. The first images in both panels represent the bipartite networks of both of the present and prior firms and their founders. The second set of images in the left and right panels show the one-mode projection of the firm-to-firm networks. Both Firms 1 and 2 share identical positions in the firm networks and share equal *constraint* values. The bottom images in the each of the panels show the one-mode projections of the founder-to-founder networks. Firm 1's founders' constraint scores vary, but the constraint scores of Firm 2 founders do not.

and Firm 2 share identical network positions in their respective firm-level networks. From this perspective, both firms have the same number of prior cofounding ties (four) and, importantly, hold identical brokerage positions. By contrast, the last images at the bottom of the panels show the one-mode projections of the founder-to-founder networks, where founders are connected via firms that they cofounded together. As seen in the founder-to-founder networks, Firm 1 exhibits high brokerage role diversity among its founders, but there is no variation in brokerage roles for members of Firm 2. In other words, the members of Firm 1 (Founders A and B) vary in their pattern of connections and differ in their brokerage roles for the team, whereas Firm 2's founders (C and D) have identical patterns of relations and therefore identical brokerage roles. Hence, brokerage role diversity within a founding team is a distinct and measurable construct that captures variation in network positioning and relations in ways that are not evident when focusing only on the firm-to-firm network (details regarding our measurement of brokerage role diversity follow below). We therefore hypothesize that, in addition to the structural advantages of brokerage that are evident in firm-level network projections, measures of brokerage role diversity in an entrepreneurial team will further predict variation in the firm's performance.

Data Sources and Measurement

An empirical assessment of our argument requires both a measure of the team's performance, such as capital raised, and network data for a complete population of founders and their firms. Because tests of our argument require accurate measures of team members' structural roles, complete data on founder-to-founder networks are necessary to ensure that no connections are artificially or systematically excluded from the analysis. In addition, archival data that do not rely on self-reports from entrepreneurs are less vulnerable to systematic reporting biases of respondents (Bernard et al. 1984). To complement these measures, the ideal data set would also account for other attributes of the entrepreneurial team members, such as their ethnic diversity and founding experience, which may be confounded with network position. We employ a data set that meets these challenging criteria: the RUSCORP database collected by economic historian Thomas Owen (1992) on all Russian incorporations during the tsarist regime. During this period, across the Russian empire, the establishment of the two dominant forms of large corporations, the share partnership and the joint-stock company, required the approval of the central government. On such approval, a newly established enterprise was granted a charter by the tsarist administration. To the extent that no enterprise was permitted to start its business until this administrative procedure was completed, our data set includes all corporate foundings in Russia between 1869 and 1913 (Owen 1991).

Our data on the characteristics of corporate enterprises and the composition of their founding teams come from the information recorded in these corporate charters. Approximately two-thirds of our initial set of 3,762 newly founded corporate ventures were established by teams of two or more entrepreneurs, yielding a sample of 2,446 founding teams of corporations and their 9,461 individual founders, with complete information on all of our variables of interest. Although we investigate entrepreneurial teams specifically, all firm foundings, including firms established by a sole entrepreneur, are included in the founder-to-founder networks. The firms are comprised of large-scale industrial corporations and share partnerships with capital-intensive operations, ranging from textile mills and mining companies, to banks and railways. The data set is left-censored at 1869 because, to the best of our knowledge, a reliable price index to deflate ruble values is not available for earlier years. The right-censoring at the beginning of 1913 provides a natural framing of our time window because it ends just before the onset of World War I and the demise of Russia's political and economic systems.

Cofounding Network

While the original founders named on the corporate charter retained their stock share issuance, the remaining corporate shares were largely purchased by other entrepreneurs, who sought board positions or voting rights over managerial decisions (Owen 1991). Thus, the cofounding networks are comprised of relations to other founders through previous ventures, and these connections would have been a crucial means to both gain capital support and garner information on how to successfully manage firms. Connections to other founders provide not only opportunities for founders to learn from each other but also valuable ties to those most suited to offer relevant information, as in other collaboration networks (Ahuja 2000, Ferriani et al. 2009, Vedres and Stark 2010). Based on the charter information on firm foundings, we code annual bipartite networks of cofounding ties among the founders and firms in our data set for the period 1869–1913. Each annual affiliation network includes all of the founders and their firms that had been established up until the current year.[2] To facilitate measures of individual brokerage roles within teams, we then generate the founder-by-founder networks from the bipartite networks. Pairs of founders are linked to the extent that they were partners in a prior entrepreneurial founding.

Variables

Basic capital. As our dependent variable, we use the ruble amount of *basic capital* recorded in the firm's corporate charter. The *basic capital* recorded in the charter included all shares and financial commitments of the firm and is analogous to an initial public offering used in the context of present-day firms (Stuart et al. 1999, Stuart and Sorenson 2003, Thornton 1999). Tsarist corporate law stipulated that only teams that were able to accomplish these declared funding commitments within a specified time were subsequently permitted to begin operations. Any changes in the membership of the founding teams during the process of realizing the capital commitments would have precipitated a recharter document from the tsarist office, and such recharters rarely occurred (fewer than 4% of the charters in the data set). The *basic capital* is among the most important responsibilities of these founding teams and is commonly used as a performance measure for these firms (Carstensen 1983, McKay 1970, Owen 2005). In addition, systematic evidence from our Russian historical setting indicates that greater *basic capital* significantly increased the longevity of otherwise comparable firms (see the online supplementary materials Appendix A).

As the kind of ruble—silver, copper, or paper assignat—and the values of shares routinely varied from charter to charter, even within the same year, all capital values are normalized according to the standard ruble of account (Owen 1992). We then deflated all normalized capital values using the standard Saint Petersburg Institute of Economic Research retail price index (Gregory 1982). All capital values are denoted in thousands of rubles with 1913 as the base year. Where *basic capital* consisted of both stocks and bonds, the sum of both amounts is used.[3] To account for the variable's positive skew, it is log transformed.

Brokerage role diversity. This variable is our instantiation of structural role complementarity and our main explanatory variable. We use Burt's (1992) constraint measure to assess each founder's capacity to bridge across the structural holes that separate other founders. In our case, constraint measures the degree to which a founder's previous partners were also connected to each other through prior cofoundings. A founder i's structural constraint is defined as

$$Constraint_i = \sum_{j=1}^{n} \left(P_{ij} + \sum_{q=1}^{n} P_{iq} P_{qi} \right)^2 \quad q \neq i, j,$$

where P_{ij} represents the proportion of founder i's belonging to founder j. The sum, $\sum_{q=1}^{n} P_{iq} P_{qi}$, captures the indirect connections of i to q that are also connected to j. Brokerage opportunities for a focal founder arise when triadic closure among his previous partners is low, and consequently, constraint approximates a value of zero. In contrast, a founder's brokerage opportunities decrease as triadic closure increases, as reflected by higher constraint. Notably, the lower bound for this measure is zero, and the upper bound is 1.125 (Buskens and van de Rijt 2008).

To investigate the role of variance of brokerage in determining founding team performance, we followed the recommendation of Sørensen (2002) and calculated for each team both the mean and standard deviation for the founding members' constraint while also including the interaction of these effects as a term in the model. This approach demonstrates the effect of increasing heterogeneity of the founding members' constraint scores (i.e., *brokerage role diversity*) while accounting for variation in the founding team's mean constraint scores (Reagans et al. 2004).

Covariates. The RUSCORP data set, as coded from the corporate charters, provides detailed information on control variables that potentially predict *basic capital*. *Team size* counts the number of partners on a team at the time of founding and was log transformed to address the variable's positive skew. We also control for the two legal forms of business organizations found in these capital markets, the joint-stock company and the share partnership, using a binary indicator for *joint-stock organization*. Following Dahl and Sorenson (2012), we use fixed effects to control for the year in which firms were incorporated and the geographic regions in which they were based. Finally, we use fixed effects to denote the industry sector in which the new company operated. Tables 1 and 2 provide descriptive information for the firms.

We also include models in which we consider alternative explanations to *brokerage role diversity*. Because ethnic diversity has been found to negatively affect team performance (Reagans et al. 2004, Ruef et al. 2003), we use Blau's (1977) heterogeneity index as a measure of *ethnic diversity* within each team, where a value of zero indicates ethnic homogeneity. *Ethnic diversity* is based on each founder's ethnicity (see Table 2), as the tsarist administration mandated that it be recorded within the charters. Also, to account for the possibility that team-level outcomes reflect the members' first-order network connections, we specify models that include the teams' *mean* and *standard deviation of degree centrality* and the interaction of these main effects (note that diversity in members' degree centrality may be regarded as another measure of structural role complementarity). Alternative explanations also include the team's overall experience and learning from earlier entrepreneurial activities, which have been found to improve success and innovation (Eisenhardt and Schoonhoven 1990, Uzzi and Spiro 2005). For this reason, and also because founders with little to no experience in previous ventures necessarily will have higher constraint scores, we control for the experience

Table 1. Firm and Founder Summary Statistics

	Mean	SD	Min	Max
Firm summary statistics ($n = 2,446$ teams comprised of 9,461 unique founders)				
(1) *Basic capital in '000 rubles* (logged)	6.748	1.100	1.113	11.467
(2) *Brokerage role diversity*	0.057	0.119	0.000	0.679
(3) *Constraint mean*	0.841	0.255	0.057	1.132
(4) *Team size* (logged)	1.213	0.562	0.693	4.248
(5) *Joint-stock organization*	0.642	0.479	0	1
(6) *Founding year*	1896	13	1869	1913
(7) *Ethnic diversity*	0.317	0.341	0.000	0.833
(8) *Degree centrality standard deviation*	1.174	3.779	0.000	69.296
(9) *Degree centrality mean*	3.930	4.831	1.000	69.000
(10) *Total experience*	0.622	1.501	0.000	16.000
(11) *Percentage of serial founders*	0.112	0.221	0.000	1.000
(12) *Firm constraint*	1.659	0.544	0.173	2.000
(13) *Firm constraint dummy*	0.705	0.456	0	1
Founder summary statistics ($n = 10,499$ founder-firm observations)				
(1) *Founder constraint*	0.68	0.34	0.03	1.125
(2) *Founder degree centrality*	7.96	11.01	0	121
(3) *Founder experience*	0.17	0.66	0	11

Notes. Capital amounts are standardized and deflated to the 1913 ruble. Founder variables are calculated for each founder at the time of the founding. The values for serial founders therefore vary over time.

Table 2. Firm Region, Firm Industry, and Founder Ethnicity

	Percent
Regional location of firm headquarter ($n = 2,446$ firms)	
Caucasus	7.28
Center	19.30
Central Asia	1.55
Finland	0.45
North	20.81
Poland	12.76
Siberia	8.30
South	22.44
Volga-Ural	6.26
Foreign countries	0.61
In Russian empire, but exact location unknown	0.25
Industrial sector of firm ($n = 2,446$ firms)	
Construction	1.84
Finance	12.31
Manufacturing	64.55
Mining	5.40
Public administration	0.20
Transportation	10.51
Wholesale	5.07
Unclassifiable	0.12
Founder ethnicity ($n = 9,461$ unique founders)	
Armenian	2.09
French	1.98
German	17.46
Greek	1.25
Jewish	10.07
Norwegian	7.99
Russian	43.69
Tatar	1.27
Other or unknown	14.20

of the team members. For each team, we include *total experience*, specifically the sum of previous foundings by the respective team members, and an additional variable for the *percentage of serial founders* on the team.

Finally, we have noted that *brokerage role diversity* is a distinct construct from measures that capture the brokerage positions seen in firm-level projections of the founding networks. Whereas we have used Burt's (1992) constraint measure to estimate the brokerage potential of individual founders, an analogous measure of firm-level brokerage has frequently been calculated from firm-to-firm projections of the network (Ferriani et al. 2009, Reagans et al. 2004, Shipilov and Li 2008). We likewise calculated a measure of *firm constraint*, as derived from symmetric network matrices where teams (firms) are the nodes and two teams are linked if they share one or more founding members. In some cases, however, new founding teams lack prior ties to other firms in the network, which poses a challenge for this measure because supplying a value of zero inappropriately implies perfect brokerage. Therefore, following the suggestion of Buskens and van de Rijt (2008), we assign a value of two to these firms, reflecting the lack of brokerage opportunities beyond the firm. Because this may be regarded as an extreme value for *firm constraint*, however, we also generated an additional binary variable that explains variance unique to these isolated teams.

Models and Estimation

Two sets of analyses comprise our empirical strategy. In the first set, we examine the relationship between *basic capital* and *brokerage role diversity* using a variant of multilevel modeling that permits us to partition the variance associated with individual founders. Employing the same modeling strategy, we also consider alternative explanations to *brokerage role diversity*, such as other forms of team heterogeneity. Next, as a means to address potential endogeneity, we implement an instrumental variable (IV) analysis based on governmental restrictions on the rights of firms with Jewish and foreign founders to hold property in certain regions. For this latter analysis, we examine both the complete sample and samples of matched firms. The use of an IV allows us to address two potential sources of biases in the multiple membership model results. The first is an omitted variable bias, where another variable might simultaneously influence both *brokerage role diversity* and *basic capital* and thus confound the results. The second is a reverse causality bias, where greater demands for *basic capital* might lead teams to become increasingly diverse in brokerage ability.

Multiple Membership Models

Organizational research on team performance has conventionally relied on fixed effects to account for unobserved heterogeneity introduced by the participation of individual members on multiple teams (e.g., Reagans et al. 2004). In the RUSCORP sample of entrepreneurial firms, however, the number of serial founders ($n = 598$) relative to the number of firms is high, and models with fixed effects therefore risk overfitting on the available data (Greene 2008). In addition, fixed effects implicitly assume that the individuals' impacts on team-level outcomes are invariant across teams of different sizes, and there is collinearity relating to the cooccurrence of serial founders on successive founding teams. For these reasons, we draw on advances in multilevel modeling to account for individual-level heterogeneity.

The data structure in this analysis differs from the most common applications of multilevel modeling, in which outcomes are measured at the lowest unit of analysis (e.g., the performance of individuals, clustered in firms). By contrast, our dependent variable is a team-level outcome, and we therefore employ "multiple membership" models to partition the variance of member-level contributions (Browne et al. 2001). In these models, each team is characterized by a combination of random effects (varying intercepts) for each team member, inversely weighted by the number of team members. The random effects structure in these multiple membership models is formally given by the following notation, where for simplicity we present the "intercept-only" version of the model with no covariates:

$$y_i = \beta_0 + \sum_{j \in member(i)} w_j^{(2)} u_j^{(2)} + e_i,$$

where y_i denotes the (log-transformed) *basic capital* raised by team i ($i = 1, \ldots, 2{,}446$), β_0 denotes the intercept, $\sum_{j \in member(i)} w_j^{(2)} u_j^{(2)}$ denotes the weighted average of the random effects for that team's set of participating members, and e_i denotes the residual. The subscript $member(i)$ is a classification function that returns the set of individuals who belong to team i. Thus, the summation sums only over the set of individuals who are in team i, as opposed to, say, all individuals in the data. Hence, although the multiple membership models can be interpreted similarly to ordinary least-squares (OLS) regression models, they can explain variance at the two hierarchical levels and provide more conservative estimates of the independent variables.[4] To reduce bias in the variance estimates, we follow the recommendation of Browne et al. (2001) by fitting our models using Markov chain Monte Carlo (MCMC) methods while specifying "flat" priors for all parameters.

Instrumenting for Brokerage Role Diversity and Basic Capital

During our observation period, the tsar directed local magistrates to enact legal restrictions on the rights of Jewish and foreign entrepreneurs. In addition to documenting ethnicity and citizenship of the founding team, founding charters listed any legal restrictions regarding the corporations' right to own property. These restrictions banned firms with either Jewish or foreign entrepreneurial members from owning, purchasing, or leasing land in regions along the southern and western borders of the empire. Accordingly, these bans limited Jewish and foreign founders from participating in companies that would require any property ownership, such as manufacturing firms (Owen 1991). In other words, these restrictions on ownership would have influenced the selection set of potential entrepreneurial partners for founding teams and therefore our variable of interest, *brokerage role diversity*, indicating a viable instrument. In particular, we anticipate that these property restrictions would increase *brokerage role diversity* for two reasons. First, although the effect is not statistically significant, for firms founded prior to 1887, before the restrictions were imposed, *brokerage role diversity* is negatively correlated with the number of Jewish and foreign team members. Second, the law may have encouraged founders embedded in a cohesive group that included Jews or foreigners to partner beyond their focal group. In other words, because the law would have limited partner choices within such cohesive groups, some members might be forced to select partners outside of their tightly interconnected group, which would increase the opportunities for founders with little brokerage potential to partner with potential brokers outside of their preferred group.

For these restrictions to serve as an instrument in this analysis, we also have to confirm that these restrictions did not affect *basic capital* directly. We therefore replicated the full model (see Model 4 in Table 3) for firms founded prior to 1887 and included two additional variables, the *number of Jewish members* and the *number of foreign members* on the team. Neither the number of Jewish nor foreign members on a team significantly predicted its *basic capital*, suggesting that subsequent restrictions on their involvement did not affect the capital raised (see the online supplementary materials Table S.3). In addition, to assess the robustness of the IV analysis in the case that our instrument, *Jewish and foreign property restrictions*, does not perfectly satisfy the exclusion restriction, we use the approach introduced by Conley et al. (2012). This approach allows us to estimate the extent to which the exclusion restriction can be relaxed for the two-stage least squared (2SLS) *brokerage role diversity* estimators to remain informative. The results reported in online supplementary materials

Appendix B indicate that even with substantial departures from the exclusion restriction, the *Jewish and foreign property restrictions* remains a viable instrument.

Another concern is that possible differences in the types of firms founded by teams with Jewish or foreign members served to also reduce the *basic capital* that the firms raised. Hence, we created a matched sample of 1,035 firms using coarsened exact matching (CEM) to define comparable sets of firms. A strength of examining this matched sample is that the distributions of the covariates for the control firms (i.e., firms founded before the law) and the treated firms (i.e., firms founded after the law) are largely equivalent owing to the mechanics of the CEM approach. Thus, by construction, the CEM technique addresses potential balance issues in the sample. We use *region*, *firm industry*, *team size*, and *joint-stock organization* to balance the sample.

We also investigate similar models to the main multiple membership models reported with some minor differences. First, we choose not to include the interaction term of *brokerage role diversity* and *constraint mean* because interaction terms would have also included our endogenous variable. Although there are techniques to address endogenous interaction terms, these results are difficult to interpret within IV models (Angrist and Pischke 2008), and the interaction term is not central to our theory. Second, we specified clustered robust standard errors on years rather than including year fixed effects because our instrument occurs only after 1887. In addition to the two-stage least squared (2SLS) regressions, we estimate Moreira's conditional likelihood ratio (CLR) models (Moreira 2003). 2SLS estimates are very sensitive to finite-sample bias, whereas Moreira's CLR models condition the critical values to obtain correct significance levels (Hahn and Hausman 2005). The strength of the CLR approach is that it draws correct inferences regardless of the instrument's strength (Bascle 2008).

Results

Variance Components

Our results begin with Model 0 in Table 3, which is an "intercept-only" model that includes only the random effects, not the fixed effect covariates. We use

Table 3. Multiple Membership Estimates of Basic Capital Raised by Founding Teams ($n = 2{,}446$ teams)

	(0)	(1)	(2)	(3)	(4)
Intercept	6.739***	6.688***	6.729***	6.543***	6.970***
	(0.023)	(0.024)	(0.092)	(0.238)	(0.345)
Brokerage role diversity		1.002***	3.938***	4.193***	4.029***
		(0.192)	(1.066)	(1.101)	(1.067)
Constraint mean			−0.051	−0.141	−0.032
			(0.100)	(0.176)	(0.169)
Brokerage role diversity × *Constraint mean*			−4.479**	−5.111**	−4.925***
			(1.538)	(1.533)	(1.477)
Team size (logged)				−0.062	−0.112*
				(0.071)	(0.069)
Joint-stock organization				0.540***	0.524***
				(0.045)	(0.051)
Region controls (indicator coding)	No	No	No	No	Yes
Year controls (indicator coding)	No	No	No	No	Yes
Firm industry controls (indicator coding)	No	No	No	No	Yes
Random effects					
Founders	0.313	0.189	0.175	0.129	0.124
	(0.129)	(0.119)	(0.116)	(0.103)	(0.096)
Residual	1.104	1.133	1.133	1.082	0.975
	(0.052)	(0.051)	(0.051)	(0.047)	(0.042)
DIC	7,391.883	7,374.801	7,367.627	7,231.059	7,042.001

Notes. The dependent variable is the logged basic capital of firms, standardized and deflated to the 1913 ruble. Models are estimated via MCMC estimation, with computationally efficient parameter expansion of the member-level random effects to promote good mixing of the chains (Browne 2004). We run the models for 250,000 iterations, discarding the first 50,000 iterations as the "burn-in" period that allows the chains to converge to their stationary distributions. Estimates in this table are the means and standard deviations of the 200,000 iterations, which are analogous to the parameter estimates and standard errors obtained in a frequentist analysis. To compare models, we report the deviance information criterion, or DIC, with lower values indicating preferred models that effectively balance overparameterization against model fit.

*$p < 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

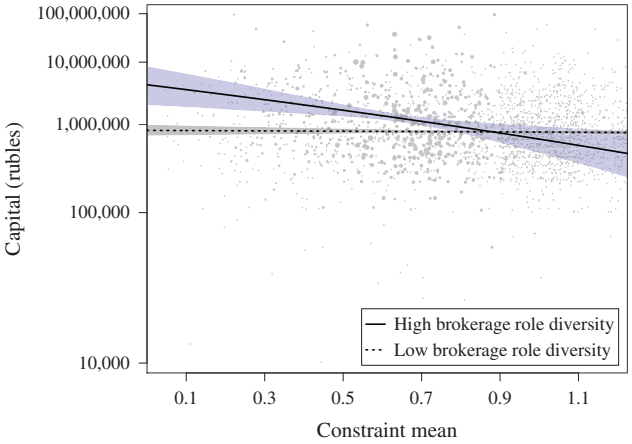
this model to calculate variance partition coefficients (VPCs). These VPCs allow us to quantify the relative importance of individual founders and team-level variables as sources of variation in *basic capital* raised. In Model 0, the estimated variance for the founder-level random effects is 0.313, and the residual variance is 1.104. We use expressions from Leckie and Owen (2013) to calculate the VPC for the founder-level variance while accounting for team size. Assuming inverse weights for the median team size of three, the numerator to calculate the VPC is $(((\frac{1}{3})^2 + (\frac{1}{3})^2 + (\frac{1}{3})^2) \times 0.313 = 0.104)$, and the denominator is the sum of the calculated founder-level variance and the residual variance $((((\frac{1}{3})^2 + (\frac{1}{3})^2 + (\frac{1}{3})^2) \times 0.313) + 1.104 = 1.208)$. Therefore, the intercept-only model shows that approximately 9% $(0.104/1.208 = 0.086)$ of the variance in the data set can be attributed to heterogeneous founder-level effects. In other words, the member-level VPC indicates that heterogeneity among individual entrepreneurs is only a nominal determinant of team performance. Instead, most of the variation in this data set is at the level of the outcome variable (i.e., the residual variance), which suggests that team-level characteristics (such as *brokerage role diversity*) are the primary source of variation in the mobilization of capital (VPC = 0.914). As predictor variables are added to models in Table 3, the founder-level variance diminishes further, which indicates that the covariates explain much of the heterogeneous success of individual founders' teams. For example, the founder-level variance is reduced from 0.313 in the intercept-only model to 0.124 in Model 4. Thus, not only is the majority of variance explained by the team-level factors, but over half of the founder-level variance is accounted for by the explanatory variables. Overall, these estimates of founder-level variance suggest that individual founders' attributes, such as their ability, learning from past ventures, or other endowments of resources, only marginally account for the success of the team.

Multiple Membership Estimates

To reiterate, we argue that structural role complementarity of an entrepreneurial team in the form of brokerage provides a benefit for the mobilization of *basic capital*. In Table 3, we present a series of models beginning with the effect of *brokerage role diversity*, subsequently including covariates that are potentially confounded with this variable.

Model 1 includes our main variables of interest, *brokerage role diversity*, which is positive and significant ($\beta = 1.002$). In other words, this model predicts that as founding teams move from a complete lack of diversity to one standard deviation above the mean in *brokerage role diversity*, the expected capital increases from 802,715 rubles to 957,525 rubles, which represents a notable increase of 19% for teams with greater variation in brokerage.

Figure 2. (Color online) Plot of *Basic Capital* in Rubles for New Firms by *Constraint Mean* for Teams with the Predictions for High (95th Percentile) and Low (5th Percentile) *Brokerage Role Diversity*, as Based on Parameters from Model 2 in Table 3



Note. Points have been jittered to promote visualization and proportionally sized to the value of *brokerage role diversity*.

While the main effect of *constraint mean* is not significant in Model 2, the negative and significant interaction term in the model ($\beta = -4.479$) indicates that the effects of *brokerage role diversity* are contingent on the team's *constraint mean*. To illustrate this interaction, Figure 2 plots *basic capital* as a function of *constraint mean* for teams with both high and low *brokerage role diversity*. As the plot suggests, the benefits to high *brokerage role diversity* are realized primarily when the *constraint mean* score is below approximately 0.8. When the *constraint mean* score is high (>0.8), by contrast, greater variation in team members' constraint scores is not beneficial to the team's performance. In other words, increased heterogeneity in the members' network brokerage potential improves performance for the firm when the team is largely comprised of brokers rather than nonbrokers, on average.

Our findings in columns (3) and (4) in Table 3 further show that the estimates for *brokerage role diversity* remain robust and positive with the inclusion of additional covariates. In Model 3, although *team size* is not significant for *basic capital*, this variable becomes more informative with the inclusion of additional controls in Model 4 ($\beta = -0.112$). Model 4 indicates that as teams increase in size from two to six members, the expected capital declines from 1,389,433 rubles to 887,716 rubles while holding other predictors at their mean values. The inclusion of *joint-stock organizations* in Model 3 shows that the organizational form is positively associated with *basic capital* ($\beta = 0.540$). Model 4 adds *regional*, *year*, and *firm industry* controls, and with the inclusion of these covariates, the main effect of *brokerage role diversity* remains positive and informative ($\beta = 4.029$), and

the interaction term remains comparable in magnitude ($\beta = -4.925$).

Alternative Explanatory Factors

In Table 4, we extend the models to consider potential alternative explanations for the effects of *brokerage role diversity* on *basic capital*. One possible explanation is that *brokerage role diversity* may simply reflect ethnic differences among the groups, which potentially provide them with connections to different ethnic groups (Ruef et al. 2003). As in previous studies, the addition of *ethnic diversity* in Model 5 significantly reduces the *basic capital* raised by teams ($\beta = -0.240$), but the effects of *brokerage role diversity* nevertheless remain

Table 4. Multiple Membership Estimates of Basic Capital Raised by Founding Teams ($n = 2{,}446$ teams)
Extended Models

	(5)	(6)	(7)	(8)	(9)
Intercept	7.073***	7.072***	6.753***	7.136***	7.050***
	(0.337)	(0.348)	(0.356)	(0.399)	(0.435)
Brokerage role diversity	4.127***	5.049**	4.348**	4.303**	4.534**
	(1.070)	(1.608)	(1.582)	(1.590)	(1.655)
Constraint mean	−0.051	−0.070	0.204	0.254	0.240
	(0.167)	(0.177)	(0.185)	(0.188)	(0.192)
Brokerage role diversity ×					
Constraint mean	−5.036**	−6.229**	−5.501**	−5.725**	−6.116**
	(1.483)	(2.092)	(2.071)	(2.088)	(2.220)
Team size (logged)	−0.118*	−0.087	0.018	−0.019	−0.023
	(0.068)	(0.078)	(0.084)	(0.086)	(0.087)
Joint-stock organization	0.545***	0.545***	0.524***	0.525***	0.524***
	(0.050)	(0.051)	(0.051)	(0.052)	(0.051)
Ethnic diversity	−0.240***	−0.238***	−0.228***	−0.232***	−0.231***
	(0.063)	(0.063)	(0.062)	(0.062)	(0.064)
Degree centrality standard deviation		−0.003	−0.035*	−0.042*	−0.042*
		(0.018)	(0.019)	(0.019)	(0.019)
Degree centrality mean		−0.006	−0.013	−0.010	−0.010
		(0.010)	(0.010)	(0.010)	(0.010)
Degree centrality standard deviation ×					
Degree centrality mean		0.000	0.000	0.001	0.001
		(0.000)	(0.000)	(0.000)	(0.000)
Total experience			0.110***	0.092***	0.099**
			(0.026)	(0.027)	(0.030)
Percentage of serial founders			0.256	0.037	0.017
			(0.166)	(0.195)	(0.198)
Firm constraint				−0.196*	−0.076
				(0.090)	(0.255)
Firm constraint dummy					−0.139
					(0.275)
Region controls (indicator coding)	Yes	Yes	Yes	Yes	Yes
Year controls (indicator coding)	Yes	Yes	Yes	Yes	Yes
Firm industry controls (indicator coding)	Yes	Yes	Yes	Yes	Yes
Random effects					
Founders	0.119	0.113	0.058	0.065	0.063
	(0.094)	(0.093)	(0.063)	(0.069)	(0.067)
Residual	0.970	0.973	0.977	0.972	0.973
	(0.042)	(0.042)	(0.036)	(0.036)	(0.035)
DIC	7,026.832	7,031.341	7,000.552	6,996.847	7,000.239

Notes. The dependent variable is the logged basic capital of firms, standardized and deflated to the 1913 ruble. Models are estimated via MCMC estimation, with computationally efficient parameter expansion of the member-level random effects to promote good mixing of the chains (Browne 2004). We run the models for 250,000 iterations, discarding the first 50,000 iterations as the "burn-in" period that allows the chains to converge to their stationary distributions. Estimates in this table are the means and standard deviations of the 200,000 iterations, which are analogous to the parameter estimates and standard errors obtained in a frequentist analysis. To compare models, we report the deviance information criterion, or DIC, with lower values indicating preferred models that effectively balance overparameterization against model fit.

*$p < 0.05$; **$p \le 0.01$; ***$p \le 0.001$.

consistent. According to the results of Model 5, ethnically homogeneous teams will outperform teams with a diversity value of 0.5 by 189,832 rubles, while holding all other predictors in the model at their means. Another alterative explanation would suggest that simply any variation in network characteristics, such as the number of ties between founders (degree centrality), might supplant *brokerage role diversity* in explaining the *basic capital*. This is not the case. Model 6 shows that the teams' variation in degree centrality (*degree centrality standard deviation*) ($\beta = -0.003$), *degree centrality mean* ($\beta = -0.006$), and the interaction of these terms ($\beta = 0.000$) are not strong predictors of *basic capital*. Although this result suggests that diversity in degree centrality is relatively unimportant for entrepreneurial teams, we note that this form of structural role complementarity could be an important predictor of team performance in other settings.

Earlier research also suggests that the founders' prior experience would be advantageous for the entrepreneurial firms (Eisenhardt and Schoonhoven 1990, Uzzi and Spiro 2005). Model 7 includes both *total experience* and *percentage of serial founders*. Although the cumulative experience of all of the founders was significant and positive for predicting *basic capital* ($\beta = 0.110$), the ratio of serial founders relative to rookies ($\beta = 0.256$) is evidently not predictive. The interpretation of *brokerage role diversity*, however, is unchanged.

In addition, we show that *brokerage role diversity* is an independent construct from the aggregate of team member ties or firm-level network constraint. Therefore, we also include the brokerage position of the firm within the firm-to-firm network. Model 8 indicates that increases in *firm constraint* reflect a significant decline in the *basic capital* ($\beta = -0.196$). These results support insights from earlier research that high brokerage of the team within the firm-to-firm network is beneficial to its success (Ahuja 2000, Burt 2005, Shipilov and Li 2008, Stuart et al. 1999, Stuart and Sorenson 2005).

Finally, because we substitute the value of two for *firm constraint* only in the case of the isolated firms in the cofounding network, as recommended by Buskens and van de Rijt (2008), we introduce a dummy variable, *firm constraint dummy*, in Model 9. This variable distinguishes the isolated firms with substituted values for *firm constraint* and therefore reveals the sensitivity of model parameters to this substitution. Because the significant effects of *brokerage role diversity* remain consistent in both Models 8 and 9, our findings for *brokerage role diversity* are robust to the inclusion of *firm constraint* as a predictor, whether or not the isolated firms are distinguished.

In summary, across these additional models, *brokerage role diversity* consistently exhibits a significant and positive effect on *basic capital*. While these latter models incorporate variables based on predictions of earlier research, including the ethnic diversity of team members, founder experience, and firm-level brokerage, the capital advantage from greater *brokerage role diversity* among team members nevertheless remains robust.

Instrumental Variable Estimates

The instrument *Jewish and foreign property restrictions* has a Kleibergen and Paap (2006) F-statistic of 10.47 in the (2SLS) regression for the full sample. This value is above the Stock and Yogo (2005) critical value of 8.96 to have no more than 15% of the bias of OLS estimates with one endogenous variable and one instrument. For the matched sample (Models 3 and 4), the critical value is reduced to 7.044 and therefore has no more than 20% of the bias of OLS estimates. Nevertheless, the identical 2SLS and Moreira's CLR coefficients presented in Table 5 indicate that our results are vulnerable neither to a finite-sample problem or to a weak-instrument problem (Yogo 2004).

For both the full sample and matched sample, we present the first-stage models followed by the 2SLS and CLR regressions in Table 5. The coefficient for *Jewish and foreign property restrictions* in the first stage is positive for both samples, as we anticipated (Models 1 and 4). The legal restrictions on the potential set of founders are positively correlated with *brokerage role diversity* for teams. Both of the 2SLS and CLR results in Models 2, 3, 5, and 6 lend support to our argument that *brokerage role diversity* is associated with greater mobilization of *basic capital*.

Finally, Appendix B in the online supplemental material reports the Conley et al. (2012) IV sensitivity analyses for both the full and matched sample. The results indicate for the full sample that conservatively at least 41% of the reduced form effect of *Jewish and foreign property restrictions* on *basic capital* would have to be through channels other than *brokerage role diversity* for the IV results to be insignificant. In other words, this sensitivity check suggests that even with potentially large violations of the exclusion restriction, where the *Jewish and foreign property restrictions* might have a relatively large direct impact on *basic capital*, the positive estimates of *brokerage role diversity* in Table 5 remain statistically significant.

Discussion

We present a novel means of capturing the variation in the portfolios of structural roles of entrepreneurial team members, and we demonstrate how this variation helps to explain firms' performance in ways that are not evident when examining only connections among firms. In our empirical case, we have examined returns to structural role complementarity in terms of the basic capital that entrepreneurial teams attract

Table 5. Instrumental Variable Estimates of Basic Capital Raised by Founding Teams

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample (n = 2,446 teams)			Matched sample (n = 1,035 teams)		
	First stage	2SLS model basic capital	CLR model basic capital	First stage	2SLS model basic capital	CLR model basic capital
Jewish and foreign property restrictions	0.025**			0.021**		
	(0.008)			(0.008)		
Brokerage role diversity		9.773**	9.773**		10.900*	10.900*
		(3.958)	(4.046)		(5.271)	(5.056)
Constraint mean	−0.430***	3.675**	3.675**	−0.463***	4.454	4.454
	(0.016)	(1.714)	(1.748)	(0.029)	(2.515)	(2.388)
Team size (logged)	−0.160***	1.350**	1.350**	−0.092***	0.965*	0.965*
	(0.007)	(0.637)	(0.654)	(0.011)	(0.478)	(0.479)
Joint-stock organization	0.007	0.410***	0.410***	0.013*	0.099	0.099
	(0.004)	(0.075)	(0.069)	(0.006)	(0.153)	(0.115)
Region controls (indicator coding)	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry controls (indicator coding)	Yes	Yes	Yes	Yes	Yes	Yes
KP Wald F-statistic	10.471			7.044		Yes
R^2	0.444			0.443		
Year clusters (n)	44	44	44	43	43	43
Moreira's CLR			[3.374, 23.534]			[3.173, 32.206]
p-value			(0.002)			(0.005)

Note. The dependent variable is the logged basic capital of firms, standardized and deflated to the 1913 ruble.
$^{*}p < 0.05$; $^{**}p \leq 0.01$; $^{***}p \leq 0.001$

from investors. Using systematic evidence from corporate foundings, our findings support our main argument that entrepreneurial teams with greater brokerage role diversity among the founding partners realize higher capital. The effects of brokerage role diversity are further moderated by the average brokerage potential among the team members. That is, when founding team members are comprised of members with high brokerage ability on average, higher levels of brokerage role diversity predict greater basic capital. Taken together, these findings suggest that brokerage role diversity, as a separate construct from firm-level brokerage, enhances entrepreneurial success via increases in starting capital. Our findings are robust in models that consider the brokerage position of the firm, the experience of the team members, and the competing categorical characteristics of founding team members.

Our results do not contravene previous studies showing the value of network brokering for firms (Ahuja 2000, Burt 2005, Shipilov and Li 2008). While we also find benefits to brokerage for entrepreneurial firms, our research suggests that the benefits are enhanced when brokerage ties are differentially distributed amongst the team members. Moreover, we are not the first to suggest that brokerage and cohesion are complementary constructs; however, prior research tends to consider complementarity primarily at the individual level rather than how it might operate across individuals within a team, as we have done here (Burt 2005, Vedres and Stark 2010). In addition, studies that have focused on the networks for teams typically define complementarity as cohesive ties inside the team paired with brokerage ties outside of the team (Oh et al. 2004, Reagans et al. 2004), whereas we focus on the composition of structural roles among the team members. In sum, brokerage role diversity extends our understanding of external brokerage ties by suggesting that firms benefit when the extent of brokering ties beyond the team is heterogeneously distributed among its members.

Drawing on previous research on individual-level trade-offs between cohesive and brokering ties (e.g., Portes and Sensenbrenner 1993), we argue and find evidence for how teams might circumvent this trade-off by permitting different team members to assume the roles of maintaining cohesive and brokering ties, respectively. However, additional research is needed to enrich our understanding of the underlying processes of brokerage role diversity that afford benefits to entrepreneurial teams. Our contention is that structural roles allow a network "division of labor" where the ability to mobilize resources arises from differentiating members based on the pattern of their relationships. We anticipate opportunities for future studies to elucidate the specific mechanisms by which these teams benefit their firms' success.

Our empirical emphasis is on the particular historical case of entrepreneurship in Russia because it

is ideally suited for understanding founding teams in emergent economies, which are rapidly increasing in economic importance (International Monetary Fund 2016). While the insights from our setting might extend to founding teams in established economies, we anticipate the findings to be the most robust for contemporary emergent economies. Entrepreneurs in emergent economies past or present often face similar conditions of limited institutional infrastructure and volatile markets (Nee and Opper 2012). A growing body of research indicates that in such settings, entrepreneurs must rely more on alternative strategies, such as leveraging personal connections to aid in mobilizing resources, than those in developed economies (Eisenhardt and Schoonhoven 1990, Khanna and Rivkin 2006, Vedres and Stark 2010). Moreover, contemporary emerging economies are typically comprised of largely manufacturing and labor-intensive industries, much like firms founded in our empirical setting (Marquis and Raynard 2015). Given the commonalities of emerging economies and the challenges that they present for entrepreneurship, we expect that the returns to brokerage role diversity in founding teams would be particularly applicable to firms in modern emergent economies.

Conclusion

Three main contributions arise from our study. First, by integrating structural roles with team composition, this new construct provides a means to uncover important group processes from a network perspective. Our theorizing considers the relational patterns of individual-level differences concurrently with team dynamics. More importantly, the construct of structural role complementarity may help to resolve issues of aggregating individual-level social capital to the team or firm (Sorenson and Rogan 2014). To date, it is largely unclear how network theorists should attribute the social benefits of individuals' connections to an organization. Provided that fostering and maintaining connections is the province of individual founders and not firms themselves, our analysis of structural roles within teams helps to resolve this issue by revealing how individual-level variation in social resources might render to the firm or group.

Second, heeding calls for greater consideration of the multiple levels critical to a new entrepreneurial success, such as individual-level abilities of the founders, firm resources, and environmental conditions, our construct allows us to account for both individual and firm factors (Thornton 1999). Our findings suggest our findings suggest that a more fine-grained understanding of firm foundings should consider how the diversity of structural roles facilitates entrepreneurship, above and beyond the established influence of ascriptive diversity (e.g., ethnicity) or past experiences (Beckman et al. 2007, Reagans et al. 2004, Ruef et al. 2003). In other words, network measures of structural diversity represent a distinct approach for understanding the social roles of founders in their teams.

Although we focus on the structural role complementarity of brokerage for capital mobilization, our construct may have applications to a broader array of settings, such as teams within organizations (Oh et al. 2004, Reagans et al. 2004). While we illustrate the value of brokerage role diversity to the success of new ventures, the mechanisms of acquiring private, diverse, and trustworthy information and mobilizing resources can be equally significant in organizational settings (Hansen 1999); brokerage role diversity may refine our understanding of the performance of project teams within organizations. In addition, brokerage role diversity is one important instantiation of structural role complementarity, but other variants also exist. For instance, a potential variant of structural role complementarity would include other forms of centrality measures, such as degree centrality. We included variation in degree centrality in our analysis not because we anticipated strong effects for this variable on basic capital but rather to test that our results were not simply driven by variation in the number of connections among members. However, in some settings variation in degree centrality may be a critical role distinction for team members. Future research on structural roles might also consider the complementarity of core versus periphery positions of team members within a firm, drawing on March's (1991) conceptualization of organizational learning. In this case, team members with core positions would be well suited to exploit the firm's stock of internal knowledge while those with peripheral positions would have a greater opportunity to explore beyond the firm's boundaries and potentially increase the firm's stock of knowledge. The potentially vast typology of structural role complementarities and consequences for performance highlight the need for an improved understanding of the intersection of team dynamics and their social networks.

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Endnotes

[1] Note that we do not mean to imply only two discrete roles of brokers and nonbrokers, but instead roles along a continuum that ranges between maximum cohesion and maximum brokerage. Empirically, our measure of role differences captures even gradual variation in brokerage roles among team members.

[2] Our data sources do not indicate how long such partnership ties lasted, and ties between entrepreneurs might have lasted for the 45 years in our observation period. Nonetheless, we also analyzed network measures where ties decayed after a certain period. For a meaningful periodization, we rely on the average duration between subsequent foundings by the same entrepreneurs. We decay ties in the cofounding networks after 10 years, which corresponds to about twice the average number of years that lapses between successive foundings (4.4 years, SD = 6.4). The duration is therefore long enough for prior ties to contribute to the portfolio of subsequent founding partnerships. For example, if we consider a team of five founding partners who established a company in 1890, then we take into account all previous cofounding network ties that each of the five partners maintained in the preceding 10 years (1880–1889). For each founding year from 1869 through 1913, we coded corresponding cofounding networks within these 10-year windows. We find similar results to those presented here.

[3] Rarely did the firms' charters list bonds; however, 2% of firms permitted the issuance of bonds, which would be included in the *basic capital*.

[4] The estimates from the corresponding GLM regression estimates are provided in online supplementary materials Tables S.1 and S.2.

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