Institutional Polycentrism, Entrepreneurs' Social Networks, and New Venture Growth

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INSTITUTIONAL POLYCENTRISM, ENTREPRENEURS' SOCIAL NETWORKS, AND NEW VENTURE GROWTH

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What is the interrelationship among formal institutions, social networks, and new venture growth? Drawing on the theory of institutional polycentrism and social network theory, we examine this question using data on 637 entrepreneurs from four different countries. We find the confluence of weak and inefficient formal institutions to be associated with a larger number of structural holes in entrepreneurial social networks. While the effect of this institutional order on the revenue growth of new ventures is negative, a network's structural holes have a positive effect on revenue growth. Furthermore, the positive effect of structural holes on revenue growth is stronger in an environment with a more adverse institutional order (i.e., weaker and more inefficient institutions). The contributions and implications of these findings are discussed.

Entrepreneurial ventures contribute to the economic development of nations; therefore, understanding the influences on the creation and growth

of these ventures is of both theoretical and practical importance (Baumol & Strom, 2007). We know from extant research that entrepreneurs often cultivate and use social networks to access resources (e.g., capital, knowledge, supplies) that facilitate new venture growth (Eisenhardt & Schoonhoven, 1996; Granovetter, 1995; Kim & Aldrich, 2005; Stam & Elfring, 2008; Stuart & Sorenson, 2007). Prior research suggests that the use of social networks is influenced by institutional contexts (e.g., Brass, Galaskiewicz, Greve, & Tsai, 2004). Institutions establish the rules of the game for entrepreneurial activities and thereby influence both the nature and outcomes of entrepreneurs' social networks (Baumol, 1990; Boettke & Coyne, 2009; Djankov, La Porta, Lopez de Silanes, & Shleifer, 2002; Hwang & Powell, 2005; Owen-Smith & Pow-

ell, 2008). The purpose of this research is to examine how formal institutions affect the development and use of entrepreneurs' social networks and new venture growth. We employ the theory of institutional polycentrism, which suggests that institutions originate from multiple (poly) rule-setting centers such as governments, associations, and communities (Ostrom, 2010).

Although there has been a considerable amount of research on the effects of specific institutions (e.g., political risk) on particular managerial decisions, institutions are complex and multifaceted (Greenwood, Raynard, Kodeih, Micelotta, & Lounsbury, 2011; Kogut & Ragin, 2006) and their effects on firm actions are interdependent (Delmas & Toffel, 2008; Hitt, Ahlstrom, Dacin, Levitas, & Svobodina, 2004). The theory of institutional polycentrism postulates that institutional environments are characterized by multiplicity, which is defined as the confluence of different types of interrelated institutions (Ostrom, 2005a). The confluence of multiple institutions is theorized to have qualitatively different effects on outcomes than a single institution or several institutions, because the confluence is characterized by dynamic interaction, mutual reinforcement, and a cointegrated and nonseparable nature of diverse institutional rules and norms within the entire institutional order (Ostrom, 2005a, 2005b; Ostrom, Schroeder, & Wynne, 1993). On the contrary, a single institution or several institutions may not affect entrepreneurial growth directly, and therefore, are alone less relevant for new ventures at early stages of development (Tzeng, Beamish, & Chen, 2011). The confluence of

political, regulatory, and economic institutions affects outcomes in interdependent and composite manners partly because of their common historical, geographic, and cultural foundations (Acemoglu, Johnson, & Robinson, 2005; Amable, 2003; Greif & Tabellini, 2010; Hall & Soskice, 2001; Hall & Thelen, 2009; Holmes, Miller, Hitt, & Salmador, 2013; Ostrom, 1986, 2005a, 2010; Sobel & Coyne, 2011). In contrast to previous research that mainly explored the influence of a single institution or regulatory, normative, and cognitive pillars of national institutions separately (Busenitz, Gomez, & Spencer, 2000; Fogel, Hawk, Morck, & Yeung, 2006), this study examines the effects of the confluence of multiple (political, regulatory, and economic) institutions on entrepreneurs' networks and new venture growth. Figure 1 presents our theoretical model.

The theory of institutional polycentrism further suggests that the confluence of weak and inefficient institutions motivates social actors to use their networks as substitutes for the lack of institutional support, because loose-knit networks help them to acquire resources from informal resource holders who partially operate outside formal institutional arrangements (Ostrom et al., 1993; Ostrom & Ahn, 2009; Webb, Tihanyi, Ireland, & Sirmon, 2009).[1] In

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[1] From the perspective of institutional polycentrism, a weak institution involves one or more institutional rules that are unable to achieve their intended goals and objectives (e.g., weak political and economic institutions), whereas an inefficient institution is an interventionist institution that increases the transaction costs of eco-

FIGURE 1
Model: Institutional Polycentrism, Network Structural Holes, and New Venture Growth
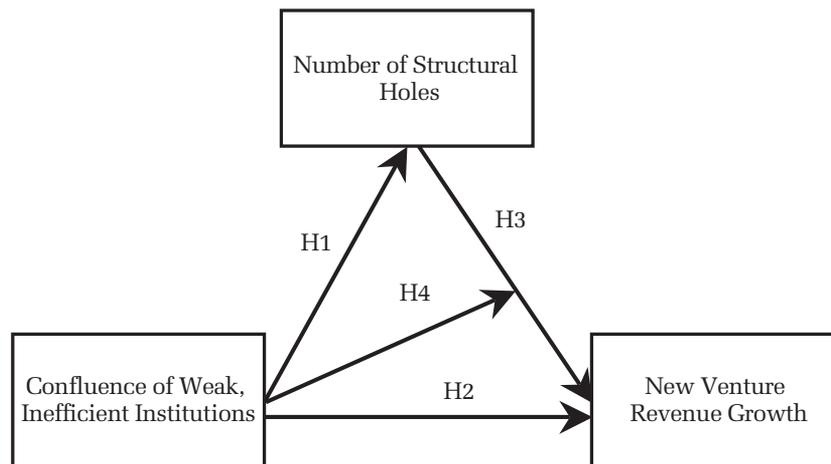
this way, the confluence of weak and inefficient institutions and social networks affects outcomes including entrepreneurial growth in synergistic ways (Ostrom, 2005b). Therefore, we focus on two concepts of the theory of institutional polycentrism to explain entrepreneurs' networks and venture growth: multiplicity of different types of institutions (e.g., political, regulatory, and economic) and institutional substitution. We posit that institutional multiplicity characterizes the institutional environment that exerts influence on entrepreneurial networks and ventures, whereas institutional substitution is a mechanism through which entrepreneurs' networks compensate for weak and inefficient institutions, thus enhancing their effect on new venture growth.

Extending the theory of institutional polycentrism and integrating it with social network theory, we examine the following four questions: (a) Does the confluence of weak and inefficient political, regulatory, and economic institutions affect the development of a network's structural holes (the absence of a link between two contacts who are both linked to an actor)? (b) Does the confluence of weak and inefficient political, regulatory, and economic institutions affect new venture growth? (c) Do structural holes in entrepreneurs' networks affect new venture growth? (d) Does the confluence of weak and inefficient political, regulatory, and economic institutions moderate the relationship between network's structural holes and new venture growth? We explore these questions using structured interview data from 637 new venture firms founded in one of four nations (China, France, Russia, and the United States) that display varying and unique institutional orders (World Bank, 2010).

A number of contributions flow from this research. First, by employing the relatively new concepts institutional multiplicity and institutional substitution to explain entrepreneurs' networks and growth of new ventures, we integrate and systematize disparate ideas on polycentric institutions to develop a cohesive theory of institutional polycentrism, which represents a contribution to institutional theory and research. Second, this study contributes to institution-based comparative research on entrepreneurship, further contributing to understanding of new venture growth by using an integrated perspective on institutional polycen-

nomic activities (e.g., inefficient regulatory institutions) (Ostrom et al., 1993; Shleifer, 2005).

trism and social networks (Cumming, Sapienza, Siegel, & Wright, 2009; Lerner & Schoar, 2010). As a third contribution, our study "opens the door" to the possibilities associated with studying entrepreneurship within an informal economy context characterized by illegality yet legitimacy (Webb et al., 2009). Finally, structural holes in entrepreneurs' networks enable them to access informal resource holders and their resources when the formal institutional order is adverse for entrepreneurs. As such, this research provides a contribution to knowledge on the contingent value of networks and how entrepreneurs manage network resources (Brass et al., 2004; Burt, 1992; Xiao & Tsui, 2007).

THEORETICAL FRAMEWORK AND HYPOTHESES

Institutional Polycentrism Theory

The notion of polycentricity refers to a spontaneous order in which multiple and independent decision-making centers and actors make mutual adjustments for ordering their relations within a general framework of rules and norms (Ostrom, 1999a, 1999b; Polanyi, 1951). In this sense, polycentricity is the extent to which the adjustment of each actor in the order is related in a certain manner to the adjustment of every one of these actors to each of the others. The totality of these spontaneous interactions and adjustments represents a polycentric order (Aligica & Tarko, 2012).

The concept of institutional polycentricity denotes spontaneous interactions of multiple institutional rules and norms, and mutual adjustments among institutional actors. Social actors, including organizations and individuals, pursue their goals in polycentric institutional settings where they comply with multiple governance rules at different levels and scales embedded in local knowledge and particular settings (Ostrom, 1990). Therefore, polycentric institutional order is a complex system of governance in which authorities from overlapping jurisdictions (or "centers" of authority) interact to determine the conditions and constraints under which units of governance, such as organizations and individuals, act legitimately (McGinnis, 2011).

Institutional polycentrism theory defines *polycentric institutions* as multiple, configurational, and context-specific institutional rules and norms that originate from, are situated in, and are enforced by numerous decision-making power cen-

ters. Therefore, *polycentric institutional order* is a self-coordinating spontaneous system that results from the interplay of multiple, complex, recombined, and particular context-embedded rules and norms, and the interchanges among numerous interdependent institutional actors (Hayek, 1973; Ostrom, 1999a; Polanyi, 1951). Thus, the main theoretical postulates of institutional polycentrism are institutional multiplicity, institutional configuration, and institutional context specificity (Greif, 2006; Hall & Thelen, 2009; Ostrom, 1986, 2005a, 2010).

In this study, we examine the roles of institutional multiplicity and institutional substitution, two key dimensions of institutional polycentrism, in the development of entrepreneurs' networks and venture growth. *Institutional multiplicity* as a confluence of institutions is defined as dynamic interplay, mutual reinforcement, and cointegration of diverse rules and norms in which the effect of change in one rule and norm or a set of rules and norms is contingent upon other rules and norms in use (Ostrom, 2011). *Institutional substitution* is a process in which weak (e.g., nonenforced) and inefficient rules lead to the rise of alternative sets of rules, norms, and networks that compensate for their lack of influence and usefulness (Crouch, 2005; Hall & Soskice, 2001; North, 1990, 2005; Ostrom et al., 1993). Thus, substitution is a process in which one set of formal institutions and informal networks is used to replace or overcome the debilitating effects of multiple weak and inefficient institutions (Deeg, 2005; Hall & Soskice, 2001).

Confluence of Weak and Inefficient Institutions and Networks' Structural Holes

The combination of weak and inefficient national-level institutions enhances the importance of informal norms and networks (Holmes et al., 2013; Ostrom, 2005a, 2005b). When national institutions are weak and inefficient, many formal and informal institutions must be considered by managers, and such a context generates uncertainty and ambiguity as to which is the most relevant institution or set of institutions for a given situation (Heberer, 2003). The authority for rule making and enforcement becomes more diffused and sometimes difficult to identify. These conditions create special challenges for entrepreneurs with new ventures, who need to identify what is needed to achieve legitimacy and to access resources for survival and growth. However, when national formal institutions are stronger

and more efficient, they often take precedence over other lower-level institutions and are more likely to be congruent with informal institutions (e.g., social norms), thereby creating an environment of lower uncertainty and ambiguity (Holmes et al., 2013).

The confluence of multiple weak and inefficient institutions creates an institutional order in which negative change in one rule or sets of rules triggers negative changes in other rules in use, because of the cointegrated and interdependent nature of institutions (Ostrom, 2005a; Sobel & Coyne, 2011). This catalytic process results in negative reinforcement among the institutions (Schneider & Karcher, 2010; Wilson & Herzberg, 2000), increased conflicts among various institutions (Hancke, 2010; Pache & Santos, 2010; Seo & Creed, 2002), and institutional deterioration, leading weak and inefficient institutions to become even weaker and more inefficient (Acemoglu et al., 2005; North & Shirley, 2008). These destructive interdependent processes make the entire institutional order adverse for entrepreneurs, motivating them to build diverse networks rich in structural holes as informal substitute channels for resource acquisition (Batjargal, 2006; Kharkhordin & Gerber, 1994; Sedaitis, 1998; Webb et al., 2009).

Networks rich in structural holes facilitate venture growth because entrepreneurs use them to gain access to nonredundant information and resources and to obtain social support (Batjargal, 2007a; Burt, 1992; Stam & Elfring, 2008). Additionally, the positive effect of a network's structural holes on venture growth is stronger when the confluence of weak and inefficient institutions creates an adverse institutional order, forcing entrepreneurs to reach out to informal resource holders who operate largely beyond their formal institutional arrangements (Nee, 2005; Ostrom, 2005b; Ostrom & Ahn, 2009).

Each type of weak and inefficient institution generates forms of institutional uncertainty and ambiguity, such as uncertainty regarding access to financial resources or as to ability to transact efficiently (Feldmann, 2007; Sobel, Clark, & Lee, 2007). However, when one set of institutions is weak, but other, relatively strong institutions exist, social actors rely on the stronger institutions to mitigate the negative consequences of the dysfunctional ones (Herrmann, 2008). For example, when labor market institutions are weak but government employment policies are relatively strong, then these policies offset the negative externalities of the dysfunctional labor market institutions (Wulfgramm, 2011). In this way, the negative implications of one

type of weak and inefficient institution are less detrimental for entrepreneurs if there are other stronger and more efficient institutions that compensate for the deficiencies (Heberer, 2003). However, when there is a confluence of different types of weak and inefficient formal institutions, the negative synergy makes the entire formal institutional environment highly uncertain for entrepreneurs, because there is little or no formal institutional support of which they can be assured (Boettke, Coyne, & Leeson, 2008; Fogel et al., 2006; Ovaska & Sobel, 2005; Wilson & Herzberg, 2000). The cumulative effects of the negative synergy among weak and inefficient institutions increase the strategic value of diverse entrepreneurial networks (Batjargal, 2000, 2003a, 2007a; Heberer, 2003; Sedaitis, 1998; Xin & Pearce, 1996).

Political institutional systems that lack democratic checks and balances tend to be weak and unstable, resulting in distrust among social actors, including entrepreneurs in such institutions (Ledeneva, 1998). These political institutions often disadvantage those groups that are not members of the ruling political parties and clans (Tsai, 2007). The mistrust of public institutions results in the development of diverse private networks that serve as alternative channels for information exchange, resources, and social support (Tsai, 2002). The real and perceived institutional discrimination motivates entrepreneurs to build nonredundant networks as safety nets (Batjargal, 2003b; Ostrom, 2005a). The concentration of political power in the executive branches of government leaves judicial authorities weak (Shleifer, 2005). These conditions increase transaction costs for entrepreneurs, causing them to use private channels (e.g., trusted intermediaries) through which they can complete important transactions (McMillan & Woodruff, 1999).

Weak economic institutions (e.g., institutions responsible for capital availability and market liquidity) directly and indirectly influence entrepreneurs' network structures (Aldrich & Ruef, 2006; Batjargal, 2006). For example, a shortage of loans and investment funds for start-up ventures motivates entrepreneurs to search for financial resources from diverse sources such as business angels, neighborhood credit associations, and other informal financial networks (McMillan & Woodruff, 1999; Tsai, 2002). Further, money-market illiquidity and inflexible exchange rates disadvantage new ventures disproportionately. Therefore, entrepreneurs mobilize bridging ties in their networks to overcome these difficulties generated by weak eco-

nomic institutions (Batjargal, 2005; Stam & Elfring, 2008).

Interventionist regulatory institutions (e.g., overly bureaucratic registration procedures) produce a great deal of institutional inefficiencies that increase entrepreneurs' transaction and opportunity costs (Ardagna & Lusardi, 2010; Ostrom, 2005b; World Bank, 2010). These inefficiencies force entrepreneurs to employ particular network-based strategies (e.g., relational contracting) to reduce transaction costs (McMillan & Woodruff, 1999). Networks rich in structural holes enable entrepreneurs to obtain permissions, licenses, and quotas and to re-enforce contracts and curb the predatory prerogatives of the government, because these ties serve as bridges to valuable contacts in distant social clusters (Batjargal, 2003a, 2003b; Frye, 2000; Frye & Shleifer, 1997).

The confluence of weak and inefficient political, economic, and regulatory rules heightens the value of diverse and loose-knit networks through several mechanisms, such as the dynamics associated with negative mutual reinforcement and synergy (Schneider & Karcher, 2010; Wilson & Herzberg, 2000), increased institutional conflicts and contradictions (Hancke, 2010; Pache & Santos, 2010; Seo & Creed, 2002), and institutional deterioration and reversals (Acemoglu et al., 2005; North & Shirley, 2008). The distrust in political institutions enhances entrepreneurs' reliance on network-based strategies and tactics that are used to cope with weak economic institutions and inefficient regulations (Spicer & Pyle, 2002). The chronic financial disadvantages generated by inferior economic institutions justify and perpetuate obtaining financial and other tangible resources from network ties, which are often cultivated for purposes of circumventing intrusive regulatory institutions (Malesky & Taussig, 2009; World Bank, 2010). Weak legal protections through court systems together with predatory inclinations of government bureaucracies often make informal channels of protection the primary and perhaps the only alternative available to entrepreneurs (Volkov, 2002). The legal and administrative restrictions on business activities—in combination with frequent shortages of cash, foreign currency, and supplies—compel entrepreneurs to rely to a greater degree on loose-knit personal networks (Tsai, 2002).

The combination of weak and inefficient institutions serves as a catalyst for conflicts within an institutional system (Hancke, 2010). For example, burdensome regulations clash with market-based

economic institutions that require relative freedom and strong legal foundations to operate effectively (Bjornskov & Foss, 2008; Nee, 2005; North & Shirley, 2008). Inefficient (often contradictory) regulations exacerbate institutional confusion and impose competing demands on organizations that can be especially challenging for new firms (Pache & Santos, 2010). Amalgamated weak and inefficient institutions often lack conflict resolution mechanisms, thereby potentially escalating disputes among different actors (Ostrom, 2005a). The series of weak and inefficient institutions often results in institutional deterioration that increases the risk for entrepreneurs in the institutional context (Acemoglu et al., 2005; North & Shirley, 2008). Frequent policy reversals precipitate constant rule changes that amplify institutional uncertainty.

Thus, negative synergy, institutional conflicts, and institutional deterioration generate risky and adverse institutional environments for entrepreneurs (Guseva & Rona-Tas, 2001; North, 1990; World Bank, 2010). As a result, entrepreneurs are forced to cultivate networks rich in structural holes to cope with such adversity and to access resources (North, 1990). These negative institutional processes heighten the value and utility of entrepreneurial networks rich in structural holes (Ostrom, 1990, 2005b); entrepreneurs use networks as substitutes for weak and inefficient formal institutions. These arguments lead to the following hypothesis:

Hypothesis 1. The confluence of weak and inefficient institutions has a positive effect on entrepreneurial networks' structural holes (i.e., entrepreneurs' networks have more structural holes).

Confluence of Weak and Inefficient Institutions and New Venture Growth

A single weak or inefficient institution can adversely influence the revenue growth of young firms (Frye & Shleifer, 1997). However, the combination of multiple weak and inefficient institutions has a strong, cumulative, negative effect on revenue growth, because these institutions reinforce one another's harmful effects (Schneider & Karcher, 2010; Wilson & Herzberg, 2000), impose contradictory demands on new firms (Pache & Santos, 2010), and tend to be unstable (North & Shirley, 2008; Sobel & Coyne, 2011). The negative influences of weak and diffuse institutions increase the challenges of identifying growth opportunities, create higher transac-

tion costs, and constrain access to resources. The confluence of these institutions makes it difficult to develop effective sales and marketing strategies, especially for new venture firms. These problems are reflected in lower revenue growth (Boettke et al., 2008; Fogel et al., 2006; Ostrom, 2005a; Ovaska & Sobel, 2005).

Weak political institutions often impose restrictions on social activities that in turn hinder entrepreneurial opportunity identification and innovation (Batjargal, 2007a; Tsai, 2007). Weak political institutions and bureaucratic regulatory controls tend to foster corruption and bribery that hinder entrepreneurs' risk taking (Tonoyan, Strohmeyer, Habib, & Perlitz, 2010). Under these conditions, new ventures are less likely to grow.

Inefficient regulatory (including legal) institutions often result in insecure property and contractual rights, which negatively influences both growth incentives and intentions, because entrepreneurs are unsure of their ability to obtain and retain adequate returns from a venture's strategic actions (e.g., introduction of new product) (Baumol, 1990; Desai, Gompers, & Lerner, 2005; Frye & Shleifer, 1997). The overly bureaucratic rules redirect entrepreneurs' attention, time, and energies away from revenue generation activities and thereby increase overall opportunity costs (World Bank, 2010).

Weak economic institutions are especially harmful to young firms because they constrain entrepreneurs' access to equity and debt capital (Batjargal & Liu, 2004; Malesky & Taussig, 2009). The limited supply of funds for capital investment reduces operating working capital available for production and services, thereby restricting revenue growth (LeLarge, Sraer, & Thesmar, 2010). Similarly, a shortage of or restrictions on the use of foreign currency hampers new ventures' ability to import new technologies, product components, and raw materials and to sell their products in overseas markets (Tsai, 2002). The combination of weak and inefficient institutions results in negative synergy because of destructive mutual reinforcement and increased institutional contradictions and reversals that disrupt venture growth processes and trajectories (North & Shirley, 2008). Drawing on these arguments, we propose:

Hypothesis 2. The confluence of weak and inefficient institutions has a negative effect on the revenue growth of new ventures.

Networks' Structural Holes and New Venture Growth

As an alternative channel for resource acquisition, a network's structural holes enable entrepreneurs to access informal resource holders who partially operate beyond formal institutional arrangements (e.g., overseas informal investors) (Batjargal, 2007a; Burt, 1992). In contrast, dense networks with fewer structural holes connect entrepreneurs with local resource holders who often operate within a shared institutional order (Granovetter, 1995). Entrepreneurial networks rich in structural holes facilitate a new venture's revenue growth through six mechanisms: access to nonredundant information, knowledge, and referrals; brokerage; access to tangible resources; structural autonomy; social and emotional support; and the transitivity mechanism (Burt, 1992; Granovetter, 1973, 1995; Stam & Elfring, 2008; Stuart & Sorenson, 2007).

Loose-knit and diverse networks rich in structural holes enable entrepreneurs to obtain nonredundant private information about sales opportunities (e.g., information about new market segments for existing products, new products for current clients, and new distribution channels in a timely fashion), because these networks serve as bridging ties to distant clients (Batjargal, 2010a; Stam & Elfring, 2008; Stuart & Sorenson, 2007). The sales referrals and recommendations from trusted ties generate higher revenues, and interpersonal trust and expectations between entrepreneurs and referees are likely to transfer to third parties (e.g., new clients) (Castilla, Hwang, Granovetter, & Granovetter, 2000). Such relational trust lubricates and speeds up the sales processes of customization, pricing, delivery, and after-sales services (Uzzi, 1997).

Brokerage is a process by which intermediary actors facilitate transactions between other actors lacking access to or trust in one another. The brokers generate returns each time they broker an exchange (Marsden, 1982). Entrepreneurs can benefit in these cases by serving as intermediaries between potential suppliers and customers from distant network clusters (Burt, 1992).

The bridging ties to different social clusters enhance entrepreneurs' access to diverse tangible resources (Batjargal, 2010b; Stam & Elfring, 2008). Having access to a broader set of resources in-

creases the probability that entrepreneurs will have access to the type and amount of resources needed at any given time. The increased flows of money, materials, and technologies enable entrepreneurs to formulate and execute more aggressive sales and marketing strategies that stabilize or enhance revenue streams and make income growth sustainable over the long term (Batjargal & Liu, 2004).

An important but sometimes overlooked mechanism through which structural holes generate benefits is the relative structural autonomy that low-density networks generate. Entrepreneurs who rely on disconnected network clusters are less dependent on a few powerful network members (e.g., suppliers and customers), who might attempt to exercise control over the entrepreneurs. Structural independence gives entrepreneurs freedom to act on revenue opportunities without compromising their sources of resources and support (Burt, 1992).

Structural holes can also provide potential socioemotional benefits to entrepreneurs from diverse ties. The different people who populate entrepreneurs' networks, such as mentors, friends, and family members, each satisfy different socioemotional needs of entrepreneurs (Carsrud, Gaglio, & Olm, 1987). While mentors provide encouragement for business achievements, friends and family help entrepreneurs to cope with work-related stress and the competitive pressures endemic to entrepreneurial ventures. Importantly, disconnected support networks make it less likely that social problems and the challenges they generate would migrate from work to families and from families to work. In this sense, loose-knit networks serve as a buffer or protection for entrepreneurs. This situation promotes enhanced confidence, commitment, and psychic resources on the part of the entrepreneurs, thereby better enabling them to concentrate on revenue generation activities (Krueger & Dickson, 1994).

The last mechanism that facilitates revenue growth is transitivity of network triads. When an entrepreneur connects and integrates two trusted contacts from distant network clusters, positive outcomes, such as the integration of different knowledge stocks and resources, access to venture capital, and alliance creation, can occur (Batjargal, 2007b; Granovetter, 1973). These outcomes have the potential to contribute to higher revenue growth in entrepreneurial ventures. For example, the combination of different knowledge stocks and/or other resources potentially allows firms to identify and exploit new market opportunities.

Summarizing these arguments, we propose:

Hypothesis 3. Entrepreneurial networks' structural holes have a positive effect on the revenue growth of new ventures.

The Moderating Role of the Confluence of Weak and Inefficient Institutions

The effects of an entrepreneurial network's structural holes on revenue growth are greater when the confluence of weak and inefficient institutions creates an adverse institutional order with which entrepreneurs must cope. More specifically, we expect that networks rich in structural holes serve as substitutions for weak and inefficient formal institutions helping entrepreneurs to access informal resource holders who partially operate beyond formal institutional arrangements (Deeg, 2005; Nee, 2005; Ostrom & Ahn, 2009). Resources accessed from these sources are generally helpful, but they have greater importance and are critical to enhancing venture growth when formal institutions are weak and inefficient.

Institutional environment represents an important component of the context within which new venture firms must operate and seek growth. While a single weak institution or several inefficient institutions may have small or negligible effects on entrepreneurial growth (Tzeng et al., 2011), the confluence of multiple weak and inefficient institutions creates a hostile institutional context for entrepreneurs due to negative synergy among the various institutions (e.g., negative reinforcement, and institutional conflicts and deterioration) (Volkov, 2002). The adverse institutional order results in more challenging opportunity identification, high transaction costs, constrained access to resources, and inadequate sales strategies. Under these conditions, entrepreneurs need to mobilize their personal networks as alternative channels to increase revenues, because the formal institutional support available is deficient (Boettke et al., 2008; Heberer, 2003). The diverse networks rich in structural holes substitute for the functions generally provided by institutions and thereby enable entrepreneurs to recognize new revenue opportunities efficiently (e.g., cost effectively), reduce transaction and opportunity costs, access financial and material resources from informal channels, and support their actions to formulate and execute sales-marketing strategies (Aidis, Estrin, & Mickiewicz, 2008;

Aoki, 1994; Batjargal, 2010a; Granovetter, 1995; Tsai, 2002; Webb, Kistruck, Ireland, & Ketchen, 2010). Thus, personal networks compensate for the deficiencies of multiple weak and inefficient institutions. As a result, the networks become even more important in the context of an adverse institutional order, and thus, entrepreneurs depend more heavily on them under these conditions.

Networks supplement or supplant weak and inefficient rules and prescriptions when the goals, intentions, and expectations of formal institutional actors and entrepreneurs are incompatible and conflicting (Estrin & Prevezer, 2011). One pervasive outcome of weak and inefficient institutions is rampant corruption, in which formal institutional actors (rule makers and enforcers) become personal rent seekers (Baumol, 1990; Boettke et al., 2008). And, when formal institutions are antagonistic, a reliable protection is trusted social relationships (Ostrom & Ahn, 2009). Diverse network ties can be used for protection when the intentions and behaviors of multiple institutional actors and entrepreneurs are hostile (Helmke & Levitsky, 2004). For example, by mobilizing members of their dispersed networks, entrepreneurs may be able to avoid paying illegal fees and bribes and to secure their property (Batjargal, 2003b; Li, Meng, Wang, & Zhou, 2008; Volkov, 2002). The transaction costs of using ties as protection can sometimes be high, but the costs are lower than acquiescing to corruption. And these ties will allow entrepreneurs to enhance their venture's growth while simultaneously avoiding the costs emanating from corrupt practices.

Thus, the combination of weak and inefficient institutions leads to greater returns from networks for entrepreneurs. In other words, this type of institutional environment enhances the importance of and the value created from entrepreneurial networks. Specifically, the confluence of weak and inefficient institutional rules enhances the positive effects of a network's structural holes on the revenue growth of new ventures. Thus, we hypothesize:

Hypothesis 4. The confluence of weak and inefficient institutions positively moderates the effect of networks' structural holes on revenue growth of new ventures. The positive relationship between structural holes and revenue growth is stronger in a more adverse institutional order due to the confluence of weak and inefficient institutions.

METHODS

Country Institutional Polycentricity

We chose China, Russia, France, and the United States as country contexts for this study for the following reasons. First, the four nations indicate varying confluences of different political, regulatory, and economic institutions for entrepreneurship (World Bank, 2010). China combines communist political institutions, a mixed legal system of communist and German laws, and hybrid economic institutions of state, collective, and private ownership. In contrast, Russia blends a semidemocratic political institution, a formerly socialist judicial structure, and a transitioning overregulated market economy. The French institutional system is comprised of a European political institution with a powerful presidency, a civil law tradition, and a coordinated market economy. The United States has a liberal presidential political institution, a common law system, and a liberal market economy.

Second, the institutional order in each country represents a unique configuration of institutions, in which each type of institution has a different weight and influence within the whole system. For example, political institutions have relative dominance over other types of institutions in China (Nee, 2005; Xu, 2011), whereas in Russia, the bureaucratic regulatory institutions have a great deal of influence on economic and social institutions (Shleifer, 2005). In contrast, social welfare institutions carry strong weight within the French national system, and market-based economic institutions exert strong influence on political and regulatory institutions in the United States.

Third, the evolutionary trajectories of multiple institutions in each country differ. For example, in China, while political institutions preserve the status quo, private property–based market institutions are growing strong. In Russia, there is an increasing gap between predatory bureaucracies and private property–based institutions (Batjargal, 2007c). The social welfare system in France is expanding, thereby placing increasing pressure on financial institutions. In the United States, a tenuous balance between political, regulatory, and economic institutions is maintained via the country's legal system and mature institutions. Thus, the different institutional confluence, configuration, and evolutionary trajectories in these countries provide useful settings in which to test the theoretical ideas based on institutional polycentricity.

Sample, Procedure, and Survey Data

We conducted structured telephone interviews with 205 Chinese, 105 French, 172 Russian, and 155 US entrepreneurs. The Chinese and Russian data were collected in the summer and fall of 2005; the American data were collected in the winter of 2006 and spring of 2007; and the French data were collected in the winter and spring of 2007.

A particular challenge in international entrepreneurship research is to achieve methodological and sampling equivalence across international contexts (Cumming et al., 2009). We adopted the following seven sampling criteria and procedures. First, we identified entrepreneurs in each country and city using various information sources.[2] In the United States, entrepreneurs were identified through the Dun & Bradstreet database and through minority- and women-based business directories in Texas and Arizona. In Russia and China, there is no equivalent of Dun & Bradstreet. Therefore, our sample was derived from a number of data sources: government-created databases, telephone directories, and specialized business directories in Beijing and Moscow. In France, we identified entrepreneurs from entrepreneurs' associations (e.g., *Centre des Jeunes Dirigeants* and *Club des Entrepreneurs*) and leading business school alumni directories.[3] Although the use of various information sources makes sampling less systematic, this approach enabled us to identify more and diverse ventures and, arguably, made the sample more random because various databases and directories are likely to counterbalance one another's biases.[4] Second, we

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[2] The complete list of all information sources in Chinese, Russian, French, and English is available upon request.

[3] Centre des Jeunes Dirigeants and Club des Entrepreneurs are two of the largest and most active entrepreneurial associations in France, and they operate mostly in large cities such as Paris.

[4] The usage of many different information sources for identification of sample populations of new ventures is necessary in emerging economies for the following reasons. First, in China and Russia there are no complete, systematic, and well-established databases of new ventures. If there are some, access to them is limited for scholars—in particular, for those scholars based in the West. Therefore, researchers are forced to use only publicly available information sources. Second, in the emerging economies, certain types of enterprise databases, company directories, and membership lists of associations are likely to be biased in some dimensions,

oversampled women entrepreneurs in each country, because they are fewer than men entrepreneurs around the world (Langowitz & Minniti, 2007). Third, we tried to avoid sampling low-growth-intention "life-style" start-ups, self-employed sole entrepreneurs, and necessity-based, survival-type ventures, particularly in the emerging economies of China and Russia (Langowitz & Minniti, 2007). Therefore, we interviewed entrepreneurs in large metropolitan areas including Beijing, Moscow, Houston, Phoenix, and Paris. Fourth, a firm had to be eight years old or younger, in line with previous research on new ventures (Zahra, 1996). Fifth, the firm could not be a franchise, subsidiary, or spin-off of an established organization (to ensure that the venture has true financial and managerial independence). Sixth, each new venture had to be domestically owned (i.e., with no foreign stake in the venture). Seventh, each respondent had to be a majority owner of and have a decision-making role in the firm (e.g., CEO).

In China, 817 ventures met our sampling criteria. We successfully contacted 513 firms but could not reach the remaining 304 ventures. The response rate was 40 percent in China (205 firms responded).

because the purposes of creating databases and directories differ from organization to organization. For example, local governments may set up databases for collecting taxes and for policy purposes such as the promotion of women's or high-tech entrepreneurship. The specialized directories of women's business associations (e.g., "Women entrepreneurs in Beijing's Zhongguancun high-tech district") will list only those women entrepreneurs who are active members of associations, clubs, and other organizations. Databases of venture capital and consulting companies (e.g., Zero2ipo) in China are likely to list firms in certain industries (e.g., IT or nanotechnology) or high-growth firms. In addition, many databases and directories contain information about those ventures registered in a particular location, and may not have information for those ventures registered elsewhere but operating mainly in that location. For example, when we collected interview data in Beijing and Moscow, we realized that there were many ventures that operated mainly in Beijing and Moscow but were registered elsewhere. These ventures were not listed on any of the local government-run databases but came up in other directories. Therefore, the use of various information sources is likely to counterbalance systematic biases of different databases and directories and make the sample more random and balanced. Third, World Bank researchers adopted a similar approach by using multiple information sources and found this approach to be valid (Djankov et al., 2006).

In Russia, 652 ventures met the sampling criteria. We were able to contact 507 firms but could not reach the remaining 145 firms. The response rate was 30 percent in Russia (172 firms). The response rates in France and the United States were 37 percent (105 firms) and 30 percent (155 firms), respectively. The overall response rate of 35 percent (637 responded out of 1,820 contacted) compares favorably with most network surveys (Marsden, 1990). More than 80 percent of entrepreneurs stated that high growth is the most important goal. This result confirms that the majority of the ventures were high-growth-intention start-ups.

Trained interviewers conducted telephone interviews using a specially designed questionnaire. The survey instrument was first developed in English and then translated into Chinese, Russian, and French. We employed back translation to ensure equivalence in the survey questions across the four countries. As this is a cross-level study, we collected institutional data at the country level, social network data at the individual level, and venture growth data at the firm level (Hitt, Beamish, Jackson, & Mathieu, 2007).

Measures

Independent variables. In this study, we used the strength-weakness composite institutional variable to capture the confluence of weak and inefficient political, regulatory, and economic institutions at the national level. The partial least squares (PLS) analytical tool provided differential weights for each component within the composite (latent) variable. We focused on national institutions because they provide a general framework within which subnational institutions are nested and embedded (Ostrom, 2005a). Data on formal institutions were obtained by gathering information on country-level political, regulatory, and economic environments. We used the data from Holmes et al. (2013) and the output of an exploratory factor analysis of the institutional variables that they completed (see Appendix A). The data were reduced to 20 variables, which loaded on four factors—political democracy, regulatory control, capital availability, and market liquidity—as noted in Appendix B. Political democracy reflects the means through which government officials and other individuals enact changes in formal institutions. Regulatory institutions establish and enforce laws and policies that govern business activities. Capital availability influences the investment decisions of organiza-

tions and individuals by affecting both their access to capital and its value. Market liquidity captures a country's liabilities, exchange rate, and liquidity. To measure institutional weakness/inefficiency, we reverse-coded the factors of political democracy, capital availability, and market liquidity. The regulatory control institutions variable stands in contrast. Although some legal and regulatory protections are desirable for entrepreneurs, overly bureaucratic rules and procedures can be onerous and highly inefficient, especially for entrepreneurs. In effect, such rules and policies greatly increase the transaction costs and opportunity costs for entrepreneurs. A higher institutional score reflects a greater confluence of weak and inefficient formal institutions. The latent variable *institutions* was then created using these factors, where political democracy (0.90), regulatory control (0.99), capital availability (0.84), and market liquidity (0.89) load positively in the PLS analysis.

We used this measurement for the following reasons. First, the operationalization and measurement are consistent with the concept of institutional multiplicity. We examine one form of institutional multiplicity: confluence of various types of institutions (political, regulatory, and economic). Second, this measurement enables us to examine the effects of national-level formal institutions on outcomes in a composite and cointegrated manner. Therefore, the measurement is consistent with theoretical arguments and this study's goals.

We used the name generator method (Burt, 1992; Marsden, 1990) to obtain data on entrepreneurs' personal (egocentric) networks involving three contents: business advice, business resources, and emotional support. We employed the name generator method because it enables measuring structural properties of networks (i.e., density and structural holes) thoroughly while being less likely to suffer from social desirability bias than other methods, including the position generator method. Each respondent was asked to provide the first names or the surnames of up to five individuals in his or her network from whom he or she had obtained business advice (e.g., information and suggestions), business resources (e.g., finances, supplies), and emotional support in the last six months.[5] Each

contact was named only once. For each contact, respondents also answered the question "How close do you feel to this person" as "very close," "close," "neither close not distant," or "distant." Similarly, the respondent reported his/her perception of the relationship between two pairs of contacts as "close," "neither close nor distant," or "distant." "Distant" was defined as "two individuals rarely work together, are strangers, or do not enjoy each other's company." We used Burt's (1992) measure of network constraint to capture structural holes:

$$C_i = (p_{ij} + \sum_{q=1}^{N} p_{iq}p_{ij})^2, q \neq i, j,$$

where p_{ij} is the proportion of total relational strength that i directly allocates to j, p_{iq} is the proportion of total relational strength that i devotes to q, and p_{qj} is the proportion of total relational strength that contact j devotes to contact q. We used UCINET 6 software to calculate the network constraint score. *Structural holes* is measured as 1 minus the network constraint score, with larger scores denoting more structural holes. We asked a series of additional questions about each contact in each network (eliciting, e.g., how many years the respondent had known the contact, the contact's gender, and the nature of the tie, such as "family").

Dependent variable. We use revenue growth as a proxy for venture performance because it is a common measure of the success of new ventures (Baum, Locke, & Smith, 2001) and is more appropriate than alternative measures in cross-country and cross-industry comparative contexts (Brush & Vanderwerf, 1992). In the interview, we asked for revenue growth information for the four years prior to the time of the telephone survey. Revenue growth is the difference between sales in two consecutive years divided by sales one year earlier. The variable *revenue growth* is the sum of revenue growth percentages divided by the number of revenue years.

Control variables. We control for *firm age*, measured as years since the date of founding, and *firm size*, measured as the number of full-time employees. We control for demographic attributes and human capital of the entrepreneurs. *Entrepreneur's age* is measured in years, and *entrepreneur's edu-*

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[5] To preserve the anonymity and confidentiality of network contacts, we asked the Chinese respondents to provide surnames of their contacts (e.g., Wang or Li), and the American, French, and Russian respondents to pro-

vide first names (e.g., Peter, Helen, or Anne-Marie). Surnames are common but first names are unique in China, whereas in Russia, France, and the United States, first names are common but surnames are unique.

cation is coded as 1 when the entrepreneur's education is less than an undergraduate degree, 2 when the entrepreneur has an undergraduate degree, 3 for a master's degree, and 4 for a doctorate. We control for *entrepreneur's gender* using a dummy variable (1 = "woman"). *Entrepreneur's managerial experience* is the number of years the entrepreneur worked as a manager before starting the new venture. We control for network size, network density, and composition (women and family ties) in order to estimate the net effect of structural holes. *Network size* is the sum of the number of contacts named in the three networks. *Network density* measures the extent to which contacts (alters) are connected to each other (Marsden, 1990). This variable is calculated by dividing the total number of identified relationships between the alters by the total possible number of ties, which for an undirected graph is:

$$\frac{\sum_{i=1}^{N}\sum_{j=1}^{N} a_{ij}}{N(N-1)},$$

where a_{ij} is 1 (indicating the existence of a close relationship between i and j), 0.5 (indicating the existence of neither close nor distant relationship), or 0 (indicating the absence of relationship); and N is the number of contacts (alters). The *women ties* variable is measured as the percentage of women in an entrepreneur's network (Batjargal, Hitt, Webb, Arregle, & Miller, 2009). The *family ties* variable is measured as the percentage of kin in an entrepreneur's network. Proxies for the industry environment, industry dynamism and munificence, were measured using Keats and Hitt's (1988) method. First, each new venture was coded on industry affiliation: trade, service, information technology (IT)/software, biotechnology/pharmaceuticals, or light manufacturing. Munificence is measured as the growth in revenues in each of the above industries, that is, the regression slope coefficient of revenues for the period 2000–04 (for five years in each industry). Dynamism is measured as the variation in revenues over this period in each industry—that is, as the standard error of the regression slope coefficient of revenues. This figure is then divided by the industry mean in revenues to standardize the values across industries. These two variables were used as manifest variables of a latent variable *industry*, reflecting industry environment. The data sources used to gather revenue data for China, Russia, France, and the United States are listed in Appendix C. Finally, we control for national cul-

ture because it affects formal institutions as well as entrepreneurial activities (Holmes et al., 2013). To measure culture in each country, we used data from the Global Leadership and Organizational Behavior Effectiveness project (GLOBE) (House, Hanges, Javidan, Dorfman, & Gupta, 2004). Specifically, we used *in-group collectivism, power distance, uncertainty avoidance*, and *gender egalitarianism* as cultural practice variables. These four variables were used as manifest variables of the latent control variable *culture*. Higher scores mean greater collectivism, power distance, and uncertainty avoidance, and lower gender egalitarianism.

Data Validity

We conducted validation checks on our data. In the US sample, validation was performed on a randomly selected group of 34 entrepreneurs from the sample. For this group, we readministered the survey three months, on average, following the initial survey to determine the reliability of the entrepreneurs' responses. We found the agreement between the initial and follow-up data to be more than 80 percent for venture characteristics such as firm size, firm age, and revenue growth. Follow-up questions suggested that the few differences were related to actual changes in the ventures (e.g., further growth in revenue or personnel). In France, we re-interviewed 11 of the sampled entrepreneurs (10 percent of the French sample) an average two months after the initial data collection. We asked the same questions and found 95 percent agreement on networks, venture characteristics, and revenue across the interviews.

In China and Russia, we used a different procedure to validate the data. By selecting every fifth or sixth entrepreneur in our samples, we created lists of 15 women-owned and 15 men-owned ventures in each country. We submitted revenue growth data of 30 Beijing-based firms to the Government Tax Bureau in Beijing and 30 Russian firms to the Taxation Department of the Moscow City Government for the cities where these ventures operate. We asked government officials to confirm whether our data were consistent with their data. We received confirmation that our revenue growth data for 27 Chinese firms (90%) and 24 Russian firms (80%) were consistent with the data in the respective tax offices. Social network data were validated through interviews. We asked for the telephone number of one of the contacts listed in the business resource networks. We obtained telephone numbers for 18

contacts in China and 12 contacts in Russia. We telephoned these contacts and validated the entrepreneurs' responses. We asked the contacts for their functional backgrounds and relational bases ("How did you get to know this person?"). The responses of 17 Chinese contacts (94%) and 10 Russian contacts (83%) were consistent with the data we obtained in the survey from the entrepreneurs. According to James, Demaree, and Wolf (1984), an agreement of at least 80 percent between multiple raters is necessary to establish reliability. The evidence from our validation procedures suggests that the network and revenue growth data are reliable in all four samples.

Analyses

Before hypothesis testing, we performed additional data quality checks. First, we examined the data for outliers. Using scatterplots, casewise diagnostics, and Cook's distance analysis (Cook, 1979), we found three outliers in the relationship between network size and revenue growth. These outliers were excluded from further analyses. Second, some entrepreneurs were reluctant to provide revenue growth data, resulting in 21 percent of the sample having missing data on the major dependent variable. Following Little and Rubin's (2002) guideline, we used the mean revenue growth of each country to substitute for missing data in that country. Analyses using the sample both with and without the mean substitution yielded similar results. We reported the results using the sample with mean substitution to conserve sample size and maintain statistical power.[6]

We used PLS to analyze the data for hypothesis testing because it calculates the confluence of multiple institutions by differentially weighting the four institutional factors. As a modeling approach, PLS has been used in management research fruitfully (Henseler, Ringle, & Sinkovics, 2009; Hulland, 1999). In contrast to covariance-based structural equation modeling such as LISREL, PLS is a component-based structural equation modeling approach (Esposito Vinzi, Chin, Henseler, & Wang, 2010). The main advantages of PLS are that it relies on less stringent assumptions about the distribution of the variables and is able to estimate complex models with many latent and manifest variables

such as our institutional and culture variables (Chin, 2010; Hulland, 1999; Shamir, Zakay, & Popper, 1998). The results of PLS analyses are evaluated by considering the composite reliability, average extracted variance, value of R^2, and bootstrap for the t-values (Chin, 2010; Henseler et al., 2009; Hulland, 1999). Therefore, we chose PLS considering the measures of institutions, culture, and industry, and the relatively fewer variations in the country-level variables. We used SmartPLS software to carry out the analyses (Ringle, Wende, & Will, 2005).

RESULTS

Table 1 presents the descriptive statistics and Pearson's correlations of all study variables. The average firm size is 36 full-time employees (s.d. = 61.5). Twenty-five percent of the ventures were in IT, software, and biotechnology industries; 46 percent were in trade and services; and the remaining 29 percent were in other industries. The average age of the entrepreneurs was 39 years (s.d. = 8.5). The mean network size was 5.7 contacts (s.d. = 2.5), and the mean structural holes score was 0.49 (s.d. = 0.21). The finding on the mean network size is consistent with the findings of previous surveys of egocentric networks in the general population (Marsden, 1990; McPherson, Smith-Lovin, & Brashears, 2006) and of entrepreneurs (Aldrich, Reese, & Dubini, 1989; Batjargal, 2007c). The average revenue growth was 36 percent (s.d. = 61).

Table 2 illustrates the convergent and discriminant validity analyses for the PLS models explaining network's structural holes and revenue growth of new ventures. The results indicate that institutions as an independent variable and industry and culture as control variables present strong convergent and discriminant validity.

Table 3 shows the results for the four hypotheses. Models 1 and 2 examine the effects of the confluence of weak and inefficient institutions on a network's structural holes. Model 1 is the base model for structural holes with control variables. Model 2 includes the effects of the confluence of formal institutions and shows a statistically significant positive effect on structural holes ($b = 0.15$, $p <$ .05), providing support for Hypothesis 1.

Model 3 is the base model for revenue growth with controls. Due to the high correlation between network size and structural holes ($r = .67$, $p <$ .001), the former was excluded as a control in the testing of Hypotheses 2 through 4. Model 4 in-

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[6] The results of the analyses without mean substitution are available upon request.

TABLE 1
Descriptive Statistics and Pearson's Correlations of Study Variables

Variable	n	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. Regulatory control	637	0.74	1.06																															
2. Political democracy	637	1.15	1.81	−.93**																														
3. Market liquidity	637	0.48	1.28	−.85**	.90**																														
4. Capital availability	637	2.48	2.53	−.79**	.53**	.56**																												
5. Collectivism	637	5.25	0.72	.99**	−.95**	−.86**	−.74**																											
6. Power distance	637	5.26	0.33	.28**	.08*	.04	−.79**	.21**																										
7. Gender egalitarianism	637	3.51	0.42	.05	.27**	.40**	−.51**	.01	.88**																								
8. Uncertainty avoidance	637	4.16	0.70	−.18**	−.00	−.35**	.29**	−.17**	−.50**	−.80**																							
9. China	637	0.32	0.46	.54**	−.75**	−.87**	−.09*	.57**	−.51**	−.79**	.64**																						
10. Russia	637	0.27	0.44	.50**	−.28**	.01	−.59**	.48**	.63**	.79**	−.93**	−.41**																					
11. France	637	0.16	0.37	−.30**	.52**	.17**	−.25**	−.36**	.56**	.30**	.31**	−.30**	−.27**																			
12. United States	637	0.24	0.42	−.84**	.65**	.78**	.94**	−.80**	−.59**	−.21**	−.00	−.39**	−.35**	−.25**																		
13. Trade	637	0.19	0.39	.17**	−.15**	−.12**	−.16**	.17**	.09*	.06	−.08*	.04	.13**	−.04	−.15**																	
14. Service industry	637	0.27	0.44	−.25**	.21**	.18*	.21**	−.24**	−.11**	−.06	.09*	−.08*	−.17**	.07	.21**	−.30**																
15. IT industry	637	0.17	0.37	.19**	−.19**	−.22**	−.15**	.19**	.02	−.07	.08*	.18**	−.00	.00	−.19**	−.22**	−.27**															
16. Biotech industry	637	0.03	0.17	.09*	−.07*	−.05	−.09*	.09*	.06	.05	−.06	.01	.09*	−.03	−.08*	−.08*	−.11**	−.08*													
17. Software industry	637	0.05	0.22	.09*	−.07*	−.06	−.07	.08*	.04	.03	−.04	.02	.07	−.03	−.07	−.11**	−.14**	−.11**	−.04												
18. Other industries	637	0.29	0.44	−.15**	.15**	.17**	.13**	−.15**	−.03	.03	−.04	−.13**	−.01	.00	.15**	−.30**	−.37**	−.28**	−.11**	−.14**											
19. Industry munificence	535	8,089	17,073	−.81**	.64**	.71**	.86**	−.78**	−.45**	−.13**	.02	−.35**	−.30**	−.11**	.93**	−.14**	.41**	−.14**	−.00	−.03	−.18**										
20. Industry dynamism	535	0.04	0.04	−.15**	.10*	.31**	.26**	−.13**	−.13**	.10*	−.32**	−.23**	.20**	−.38**	.39**	−.21**	−.15**	.32**	−.03	.29**	−.09*	.34**									
21. Firm age	637	4.46	2.2	.27**	−.26**	−.15**	−.17**	.28**	.05	.07	−.21**	.07	.26**	−.23**	−.14**	.04	−.08*	.07	.07	.05	−.07	−.16**	.11**								
22. Firm size	637	35.73	61.50	.32**	−.34**	−.31**	−.17**	.33**	−.03	−.10*	.00	.26**	.09*	−.18**	−.22**	−.05	−.08*	.02	.05	.03	.06	−.20**	−.02	.26**							
23. Entrepreneur's age	633	38.75	8.54	−.21**	.15**	.21**	−.27**	−.20**	−.20**	−.06	−.04	−.10**	−.06	−.13**	.29**	−.08*	.16**	−.12**	.04	−.05	.02	.28**	.1*	.14**	.09*						
24. Entrepreneur's education	637	2.14	0.75	−.19**	.22**	.11**	.04	−.20**	.06	.01	.16**	−.08*	−.17**	.28**	.03	−.30**	−.02	.13**	.19**	.15**	.02	.03	.08	−.08*	.05	.01					
25. Entrepreneur's managerial experience	633	5.81	6.84	−.37**	.28**	.27**	.40**	−.36**	−.28**	−.18**	.14**	−.08*	−.27**	−.02	.39**	−.13**	.23**	−.08*	−.03	−.05	.00	.42**	.09*	−.12**	−.03	.57**	.06				
26. Entrepreneur's gender[a]	637	0.56	0.49	−.13**	.14**	.10**	.06	−.14**	.01	.01	.05	−.07*	−.08*	.11**	.07	−.14**	−.03	.04	−.02	.03	.12**	.06	.05	−.07*	.07	.04	.1*	.1**			
27. Network size	637	5.71	2.51	.14**	.22**	.16*	.05	.16**	−.21**	−.19**	.03	.22**	−.01	−.27**	.00	−.06	.02	−.01	.07	.07*	−.03	−.04	.04	.01	.21**	.1*	.08*	.09*	−.11**		
28. Network density	637	0.42	0.27	.32**	.27**	.16*	−.27**	.32**	.16**	.17**	−.27**	.02	.35**	−.18**	−.22**	.13**	−.06	.00	.00	−.03	−.04	−.26**	−.02	.12**	.01	−.08*	−.17**	−.16**	−.05	−.02	
29. Network structural holes	637	0.49	0.21	−.02	.06	.04	.15**	−.01	−.23**	−.20**	.10**	.14**	−.12**	−.16**	.10*	−.08*	.02	−.00	.06	.02	.01	.06	.06	−.01	.18**	.10**	.10**	.10*	−.05	.67**	−.47**
30. Women ties[b]	632	0.31	0.24	−.13**	−.12**	−.12**	.12**	−.13**	−.05	−.01	−.05	−.07	−.05	.01	.13**	.03	.04	.01	.01	−.13**	−.00	.00	.01	−.00	.01	.00	−.05	.01	−.15**	.19**	.13**
31. Family ties[b]	632	0.18	0.21	−.25**	−.30**	−.19**	.05	−.27**	.12**	.08*	−.02	−.18**	−.15**	.33**	.06	.02	.04	.01	.04	−.15**	.01	−.00	−.01	−.01	−.02	−.00	−.02	−.01	−.05	.16**	.14**
32. Revenue growth[b]	637	35.94	60.75	−.42**	.34**	.32**	.43**	−.41**	−.27**	−.15**	.14**	−.12**	−.28**	.01	.42**	−.17**	.06	−.06	−.01	−.02	.16**	.42**	.09*	−.22**	−.10*	−.03	.09*	.17**	.12**	.06	−.17**

29	30	31
.18**		
.15**	.24**	
.12**	−.02	−.00

TABLE 2
Convergent and Discriminant Validity Analyses for PLS Models Explaining Structural Holes and Revenue Growth[a]

Models Explaining Structural Holes	Composite Reliability			Models Explaining Revenue Growth	Composite Reliability		
Culture	.84			Culture	.82		
Industry	.80			Industry	.75		
Institutions	.70			Institutions	.95		

Variable	Culture	Industry	Institutions		Culture	Industry	Institutions
Culture	**.63**			Culture	**.61**		
Industry	.02	**.68**		Industry	.28	**.62**	
Institutions	.40	.12	**.52**	Institutions	.37	.49	**.82**
Firm age	.01	.00	.00	Firm age	.05	.01	.06
Firm size	.00	.02	.00	Firm size	.02	.03	.09
Entrepreneur's age	.01	.04	.04	Entrepreneur's age	.04	.06	.06
Entrepreneur's education	.00	.00	.00	Entrepreneur's education	.01	.00	.02
Entrepreneur's managerial experience	.06	.08	.08	Entrepreneur's managerial experience	.14	.14	.14
Entrepreneur's gender[b]	.00	.00	.00	Entrepreneur's gender[b]	.00	.00	.01
Network size	.03	.00	.04	Network density	.12	.05	.08
Women ties[c]	.00	.00	.00	Network structural holes	.02	.00	.00
Family ties[c]	.00	.00	.01	Women ties[c]	.01	.01	.02
Network density	.04	.03	.03	Family ties[c]	.01	.00	.04

[a] Values in bold show the average variance extracted (AVE) by constructs. The other values are the squared correlations (Chin, 2010).
[b] "Woman" = 1.
[c] Expressed as percentages.

TABLE 3
Standardized Path (Regression) Coefficients from PLS Analysis Predicting Structural Holes and Revenue Growth

Variable	Structural Holes		Revenue Growth			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Firm age	.00	−.00	−.10**	−.09**	−.09**	−.09**
Firm size	.04**	.04*	.00	.07**	.04*	.03
Entrepreneur's age	.01	.00	−.14***	−.17***	−.18***	−.17***
Entrepreneur's education	−.02	−.01	−.02	.00	−.00	.01
Entrepreneur's managerial experience	−.03	−.03	.06	.06	.06	.05
Network size	.64***	.64***				
Women ties[a]	−.03	−.03	−.01	−.02	−.02	−.02
Family ties[a]	−.08*	−.07*	.01	−.02	.01	−.00
Network density	−.47***	−.47***	−.01	−.00	.04	.06[+]
Entrepreneur's gender[b]	.02	.02	.07[+]	.04	−.05*	−.05
Culture[c]	.01	.14*	−.30***	−.18***	−.17***	−.16***
Industry[c]	.01	−.02	.12*	−.00	−.01	−.00
Institutions[c] (H1, H2)		.15*		−.32***	−.33***	−.51***
Structural holes (H3)					.10*	.12**
Institutions × structural holes (H4)						.18**
R^2	.65	.68	.20	.24	.25	.27
Significance in ΔR^2 (*p*-value)		.04		.00	.01	.00

[a] Expressed as percentages.
[b] "Woman" = 1.
[c] Composite variables.
[+] $p < .10$
[*] $p < .05$
[**] $p < .01$
[***] $p < .001$

cludes the effects of the confluence of weak institutions on revenue growth and shows a statistically significant negative effect on revenue growth ($b = -0.32$, $p < .001$). Thus, Hypothesis 2 receives support. Model 5 reveals that the main effect of network's structural holes on revenue growth is positive and statistically significant ($b = 0.10$, $p < .05$), providing support for Hypothesis 3. Model 6 examines the two-way interaction effects of institutional confluence and structural holes on revenue growth. The results show that the interaction effect is positive and statistically significant ($b = 0.18$, $p < .01$), providing support for Hypothesis 4.

Robustness Checks

We conducted several additional analyses to check the robustness of the results. An important concern in entrepreneurship research is sample selection bias (Djankov, Qian, Roland, & Zhuravskaya, 2006). Therefore, we performed the Heckman (1979) two-stage estimation procedure to determine if the effects of the independent and moderator variables on revenue growth, as shown in Table 3, are robust. In the first stage of this procedure, the inverse Mills ratio (λ) was calculated using the total sample of the surveyed firms and the nonsurveyed firms. The nonsurveyed firms are the ventures that meet our sampling criteria but did not respond to our requests or that we were unable to reach. We dummy-coded the surveyed firms as 1 and used this variable as the dependent variable in a probit model.[7] We used firm age, the trade/service dummy, and interaction of firm age and the trade/service dummy as the independent variables in the probit model, because we had information on these variables in both the surveyed firms and the nonsurveyed firms.[8] Then, the inverse Mills ratio was inserted into second-stage PLS regression models

in which the dependent variable is revenue growth as a control variable. The inverse Mills ratio removes any potential bias due to sample selection and endogeneity (Hitt, Bierman, Uhlenbruck, & Shimizu, 2006). Following the Heckman procedure, we excluded firm age and the trade/service dummy in the second-stage model in estimating new venture revenue growth. The results in Table 4 show that our findings are robust when we include the inverse Mills ratio as a control.[9] These findings suggest that the original results are not subject to sample selection bias.

According to Stuart and Sorenson (2007), the cause-effect problem of networks versus venture performance in entrepreneurship research is a potential concern. Therefore, we conducted additional tests to ensure that the results do not suffer from reverse causality. Using the collected information on the duration of each respondent-alter (contact named) tie, we estimated the average dyadic ego-alter (ego is the respondent, and alter is the

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[7] Because of the lack of data on nonsurveyed firms in France and the United States, the test was conducted using those from Chinese ($n = 612$) and Russian ($n = 480$) firms. Therefore, we calculated the inverse Mills ratio using only the Chinese and Russian data. The nonsurveyed firm data from France and the United States are incomplete and sketchy due to the minor differences in the data collection procedures.

[8] We have information on gender and firm location; however, it would be inappropriate to use these two variables to test sample selection bias, because we deliberately oversampled women, and women entrepreneurs are distributed differently in various locations.

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[9] We have to use the total sample of 637 in the second stage (Table 4), because the regression results of the subsample of Chinese and Russian firms ($n = 377$) would be very different from the total sample due to the institutions hypotheses.

TABLE 4
Standardized Path (Regression) Coefficients from PLS Analysis Predicting Revenue Growth: Heckman's Two-Stage Estimation Procedure[a]

Variable	Model 1
Firm size	−.00
Entrepreneur's age	−.16***
Entrepreneur's education	−.01
Entrepreneur's managerial experience	.06
Network density	.05
Women ties[b]	−.03
Family ties[b]	.02
Culture[c]	−.13***
Industry[c]	.02
Entrepreneur's gender[d]	−.06+
Inverse Mills ratio (λ)	.18**
Institutions[c]	−.39**
Structural holes	.16***
Institutions × structural holes	.23**

[a] $n = 637$.
[b] Expressed as percentages.
[c] Composite variables.
[d] "Woman" = 1.
   + $p < .10$
 ** $p < .01$
*** $p < .001$

contact) tie age for each respondent—the sum of years known for each alter divided by the number of alters. The data showed that the sample mean of dyadic tie age is 9.52 years for advice networks (s.d. = 7.12), 7.8 years (s.d. = 6.00) for business resource networks, 16.25 years (s.d. = 10.08) for emotional support networks, and 11.14 years (s.d. = 5.69) for the overall networks. In comparison, the mean firm age is 4.5 years (s.d. = 2.20) (Table 1). These data indicate that the entrepreneurs knew most contacts well (i.e., for 6.7 years on average) before they started their ventures. Thus, the large time gap between tie cultivation and venture creation enables us to assume that networks influenced venture performance rather than venture performance affected network structure and composition.

DISCUSSION

Our findings suggest that the confluence of multiple weak and inefficient institutions is associated with larger numbers of structural holes in entrepreneurs' social networks. Such an institutional order also has a direct negative effect on new venture growth. A network's structural holes facilitate the revenue growth of new venture firms. Further, the confluence of weak and inefficient institutions enhances the effect of structural holes on new venture success. Thus, the results of this study suggest that the strength and efficiency of multiple formal institutions influence the effects of a network's structural holes on new ventures' revenue growth. Structural holes operate as a substitute for weak and inefficient rules and as a protection against destructive multiple institutional forces. Under these conditions, entrepreneurs benefit from their network's structural holes. However, those entrepreneurs who operate in settings where the entire institutional order is adverse and uncertain benefit more from their networks' structural holes. The results offer new and nuanced insights into the role of social networks for entrepreneurs operating in polycentric, weak, and inefficient institutional orders.

This research provides evidence of the contingent nature of both formal institutions and social networks for entrepreneurial success. In particular, it suggests that the concept of multiplicity as a part of institutional polycentrism plays an important role in the value of entrepreneurs' social networks for achieving success. Furthermore, the entrepreneurial networks serve different functions in different institutional orders. For example, we found that

the institutional multiplicity characterized as the confluence of political, regulatory, and economic institutions had strong influences on both the social networks employed by entrepreneurs and on new venture growth. Additionally, when the combination of weak and inefficient institutions creates an adverse institutional order, lower-level informal institutions and networks (e.g., personal networks) become more important, suggesting the importance of institutional multiplicity and substitution as core concepts of the institutional polycentrism theory.

This research extends researchers' understanding of institutional polycentrism, showing the joint effects of the confluence of formal institutions (or lack thereof) and informal networks. And importantly, the effects of polycentric institutions also extend to entrepreneurial ventures. Finally, this research extends understanding of social network theory, suggesting that institutional rules influence the use and outcomes of entrepreneurs' social networks (Granovetter, 1995).

The theoretical framework developed and tested is original and scientifically useful in a number of ways. This is one of the first studies in management and entrepreneurship to employ the concepts of institutional multiplicity and institutional substitution from the theory of institutional polycentrism. Therefore, the theoretical perspective advances knowledge of polycentric institutions and polycentric institutional orders. Further, this study is one of the first to theorize and empirically examine the interactive influence of multiple types of formal institutions and personal networks on entrepreneurial outcomes (Brass et al., 2004; Owen-Smith & Powell, 2008), showing the influence of multiple-type institutions and networks on firm outcomes. Integrating two important research perspectives, namely, institutional polycentrism theory and social network theory, enhances understanding of the contingencies and contexts in which firms and entrepreneurs must operate. As a whole, the theoretical framework opens new directions in institution-based and network-based research.

The national institutional orders in China and Russia remain highly inefficient and weak, resulting in negative synergies, conflicts and contradictions, and deterioration (Batjargal, 2010a; Nee, 2005; Shleifer, 2005; Xu, 2011). Hence, *guanxi* (connections) networks in China (Chen, Chen & Huang, 2013; Luo, Huang & Wang, 2012) and *svyazi* (connections) networks in Russia serve as func-

tional substitutes for formal institutions and as a protection against dysfunctional institutions (Djankov et al., 2006). This study confirms the importance of the structure of these two types of networks, respectively. Our study further confirms that even in strong institutional settings (such as the United States and France), networks' structural holes still offer the potential for positive returns to entrepreneurs.

This study focused on three types of formal institutions at one level. Future research should examine functional (what it does), process (how it performs and evolves), and normative (how it should be) aspects of multisource, multicode, multilevel, multitype, multisector, and multifunctional rules and norms. In particular, investigation of the relationships of multiple rules at the national versus local level, regulatory versus informal rules, and the different structures and compositions of networks is a promising direction for future research.

The institutional configuration processes (e.g., rule complementarity) should also be examined. Because polycentric institutions are dynamic, the centers of power and authority can change over time. Therefore, the causes and consequences of changing polycentric rules should be studied (Ostrom & Basurto, 2011). Moreover, context-specific rules and norms should be identified and analyzed (Ostrom, 1990).

The current study focuses on institutions at the national level. Some may argue that local institutions may have a greater influence on entrepreneurship than national ones. However, local rules and prescriptions nested and embedded in national rules and norms can be complementary to higher-level formal institutional arrangements (Ostrom, 2005a).

Further, polycentric institutional arrangements enable local actors to design unique problem-solving rules and avoid being caught between a false dilemma of "the state" and "the market" (Ostrom, 2010; Ostrom & Walker, 2000). On the other hand, highly decentralized and overlapping rules may cause confusion, spread resources thinly, and trigger conflicts among competing institutional actors such as national versus local bureaucracies (Green, 2007; Ostrom, 1999a). It is possible that polycentric institutions have inverse U-shaped effects on certain outcomes as a result of both the advantages and disadvantages that polycentric prescriptions generate.

The development and validation of comprehensive empirical measures of institutional polycentrism are crucial for understanding of polycentric governance. Further, the differences and similarities between well-established concepts such as institutional complexity and institutional pluralism on the one hand, and institutional polycentrism on the other hand, require further investigation. Various types of polycentrism such as political, legal, market, regional, cultural, and network polycentrism should be examined and used to frame research questions (Green, 2007; Ostrom, 1999b).

At a broad level, our research indicates that institutional polycentrism influences how entrepreneurs network to support their growth objectives. This research also complements the extant research suggesting that institutional polycentrism influences the domain of activity pursued by entrepreneurs, and more specifically, whether and how individuals pursue entrepreneurship in the formal versus informal economy. While the formal economy encompasses activities that are considered legal and legitimate, the informal economy includes those entrepreneurial activities that are illegal yet remain legitimate (Webb et al., 2009). As an example of informal economy activities, entrepreneurs can produce legal goods and services while skirting trademark laws, tax regulations, labor laws, or other formal institutional prescriptions. Various institutional centers each prescribe rules that govern economic activity, and entrepreneurs can leverage strategies to respond to the challenges and incentives imposed by those rules. As the jurisdictions of multiple institutional centers overlap, each center can impose prescriptions that are aligned with its own specific objectives but that conflict with those objectives and, therefore, prescriptions of other institutional centers (Webb, Bruton, Tihanyi, & Ireland, 2013). Conflict across institutional centers creates ambiguities at the institutional level as to what defines legitimate behaviors and outcomes (Fernandez-Kelly, 2006), thereby undermining enforcement and surfacing opportunities in the informal economy for entrepreneurs to exploit. While our findings suggest that some entrepreneurs can exploit network strategies to substitute for a confluence of weak institutions in growing their ventures, extant research also suggests that in other cases entrepreneurs may view the confluence of weak institutions as conferring minimal benefits for operating in the formal economy, motivating and enabling them to pursue opportunities in the informal economy instead.

We included three types of networks in our study: networks for business resources, advice, and emotional support. Post hoc analysis shows a slightly larger number of ties in the advice networks (mean = 2.21) relative to the business resource networks (mean = 1.74) and emotional support networks (mean = 1.84). Further analysis shows that both advice networks and emotional support networks positively relate to revenue growth ($r = .18$, $p < .01$ and $r = .12$, $p < .01$, respectively), but interestingly, business resource networks are not related to growth. Perhaps members of advice networks provide strategic information that is important for the development of the venture while resources networks do not offer a competitive advantage (perhaps the resources provided are necessary for competitive parity). Access to and obtaining resources may be necessary for gaining legitimacy and survival by new ventures. Future research should systematically test the effects of these different networks as well as explore other types of networks (e.g., mentor, political aid, or international networks) and the relational base of these networks (e.g., education, profession, or family) as possible factors associated with network returns. Recently, scholars have suggested that the content and process of social exchange may vary across cultures (Luo, 2011; Shore, Coyle-Shapiro, Chen, & Tetrick, 2009). For example, the role of social networks may differ in Confucian cultures (Chai & Rhee, 2010). In this study, the latent culture variable has a negative effect on the revenue growth of the new ventures. Unpacking the effect of culture and the exchange process within social networks in different cultures would contribute to further theoretical refinements in network research as well as provide additional understanding of how entrepreneurs build, maintain, and derive benefits from their networks.

Limitations

This study has several limitations. First, we relied on slightly different methods to obtain the samples and to verify the data quality in the four countries. While these small differences were dictated by the contexts in which the data were collected, they might introduce some error variance. However, if such error exists, we found no evidence of systematic effects on the results. Second, the sample may be composed of ventures that survived; however, the potential for bias in this study is not severe for the following reasons: The research

objective was to compare the financial performance of new ventures rather than examine venture survival. Previous research indicates that financial performance does not predict survival of new firms in all contexts because some financially sound ventures are discontinued while other financially distressed ventures survive longer. This conclusion is particularly applicable to firms in emerging economies (Lyles, Saxton, & Watson, 2004). In addition, we control for firm age, which has a negative effect on revenue growth (Table 3, models 3–6). We checked firm age distribution, and found that it is not skewed toward older firms. This outcome indirectly indicates that the sample does not suffer from survivor bias. Third, we compared new ventures in terms of revenue growth, which is not the only indicator for entrepreneurial success. Use of other performance indicators, such as employment growth or product development, might produce different outcomes.

Conclusion

By extending the newly emerging literature on institutional polycentrism, this study contributes to institutional theory, comparative entrepreneurship research, and social network theory. Of particular importance are the contributions to knowledge of entrepreneurship in polycentric institutional orders. To the extent that new venture creation and development is important to the economic development in countries globally, the present study provides a contribution to both theory and practice in the field of entrepreneurship. Social networks, as sources of business resources, advice, and emotional support, are especially important when the confluence of multiple weak and inefficient institutions creates an adverse institutional order for entrepreneurs. This work is interdisciplinary and has important implications for research on the effects of polycentric institutions, and on the effects of networks vis-à-vis the success of new ventures.

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APPENDIX A

Institutional Variables by Data Source[a]

Freedom House: Civil liberties index, political rights
International Country Risk Guide: Corruption.
Index of Economic Freedom (Gwartney, Lawson, & Block, 1996): Contract and property rights, fiscal burden, foreign investment restrictions, government control over wages and prices, government intervention in banking, government restrictions on industry, informal market, monetary policy, regulatory burden, trade policy.

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[a] Please see Holmes et al. (2013) for more information on institutional variables, their transformations, and definitions.

POLCON: Executive political restrictions, political constraints.
Political Risk Services: Government budget balance, capital investment, change in real wages, credit transfers, exchange rate, debt service cost, industry workforce, inflation rate, liabilities, liquidity, money supply, net reserves, nominal GDP, size of population, services workforce, trade balance, total foreign debt, unemployment rate, unionized workforce.
World Bank's World Development Indicators: Value of stocks traded.

APPENDIX B

Institutional Measurements: Results of Factor Analysis[a]

Factor	Item	Factor Loading
Political democracy	Political constraints	0.96
	Political rights	−0.87
	Civil liberties	−0.76
	Executive political restrictions	0.68
Regulatory control	Regulatory burden	0.80
	Contract and property rights	0.79
	Trade policy	0.77
	Informal markets	0.77
	Government intervention in banking	0.77
	Foreign investment restrictions	0.75
	Monetary policy	0.58
Capital availability	Money supply	0.96
	Capital investments	0.94
	Total foreign debt	0.93
	Nominal GDP	0.89
	Budget balance	−0.73
	Net reserves	0.71
Market liquidity	Liabilities	0.78
	Liquidity	−0.72
	Exchange rate	0.64
	Total proportion of variance explained	70.8

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[a] Please see Holmes et al. (2013) for a complete exploratory factor analysis with all factor loadings.

APPENDIX C

Industry Sales Data Sources

Chinese Industry Data

(1) The sales data for retail trade, wholesale trade, service, the IT industry, biotechnology, and light manufacturing for 2000–04 were collected from the following sources: the *China Statistical Yearbook* (1999–2004); Zhonghua Renmin Gongheguo Guojia Tongji Ju (National

Bureau of Statistics of the People's Republic of China). http://www.stats.gov.cn/english/statisticaldata/yearlydata. Accessed April 20, 2010.

(2) The sales data for the software industry for 2000−04 were collected from the following sources: Software and Information Service Industries are Beijing's Advantageous Industries, Beijingshi Kexue Jishu Weiyuanhui (Beijing Municipal Science & Technology Commission). http://www.bjkw.gov.cn/htm/ztrd_zxgz/zxgz090508/nig uangnan2.html. Accessed May 5, 2010.

Russian Industry Data

(1) The sales data for retail and wholesale trade for 2000−04 were collected from the following sources: *Torgovlya v Rossii* [Trade in Russia], 2005(1): 1–11; *Vorposy Statistiki* [Problems of Statistics], 2006(3): 66−77; 2006(5): 87−93; 2006(6): 72−83; 2006(10): 82−83; 2007(1): 83−94; 2007(3): 82−93; 2007(10): 60−71; Federal'naya Sluzhba Gosudarstvennoi Statistiki [Federal State Statistics Service, Russian Federation].

(2) The sales data for the service industry for 2000−04 were collected from the following sources: *Statisticheskoe Obozrenie* [Current Statistical Survey], 2000(1); 2001(1); 2002(1): 43−45; 2003(1); 2004(1): 64−66; 2005(1): 64−66; Federal'naya Sluzhba Gosudarstvennoi Statistiki.

(3) The sales data for the IT and software industries for 2000−04 were collected from the following sources: *Rossiiskii Statisticheskii Ezhegodnik* [Russian Statistical Annuals], 2004(1): 555–560; 2005(1); *Russia in Figures*, 2002(1): 269−285; 2003(1): 267−283; Federal'naya Sluzhba Gosudarstvennoi Statistiki.

(4) The sales data for the biotech industry for 2000−04 were collected from the following sources: *Promyshlennost' v Rossii* [Industries in Russia], 2005(1); *Russia in Figures*, 2001(1); Federal'naya Sluzhba Gosudarstvennoi Statistiki.

(5) The sales data for the light manufacturing industry were collected from the following sources: *Statisticheskoe Obozrenie*, 2002(1): 23−33; 2003(1); 2004(1): 39−50; 2005(1): 39−50; 2005(4); Federal'naya Sluzhba Gosudarstvennoi Statistiki.

French Industry Data

The sales data were collected from the Eurostat online database on European industries. http://epp.eurostat.ec. europa.eu/portal/page/portal/statistics/search_database. Accessed January 5, 2010.

US Industry Data

Industry sales data for the United States were gathered from Compustat North America. http://www.compustat. com. Accessed June 1, 2010.

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