INSEAD

The Business School for the World®

Faculty & Research Working Paper

The Missing Link: The Effect of Customers on the Formation of Relationships among Producers in the Multiplex Triads

Andrew V. SHIPILOV
Stan Xiao LI
2010/27/ST

The Missing Link: The Effect of Customers on the Formation of Relationships Among Producers in the Multiplex Triads

by

Andrew V. Shipilov*

and

Stan Xiao Li**

Paper forthcoming in *Organization Science*
Special issue on the Genesis of Networks
Editors: Gautam Ahuja, Guiseppe Soda, Aks Zaheer

Acknowledgements: The authors would like to thank Joel Baum, Ron Burt, Olivier Chatain, Kathy Eisenhardt, Bill McEvily, Pam Haunschild, David Krackhardt, Joanne Oxley, Aks Zaheer and Peter Zemsky for their thoughtful comments that helped develop ideas for this manuscript. This paper also benefited from comments provided by participants of ION Conference in Lexington, INSEAD Conference on Network Evolution in Fontainebleau and Organization Science Special Issue Conference in Milan. Feedback from the Senior Editor Gautam Ahuja and three anonymous reviewers has greatly helped to improve this paper. The second author acknowledges the financial support provided by a grant (grant number: 410-2009-1457) awarded by the Social Sciences and Humanities Research Council, Canada..

* Assistant Professor of Strategy at INSEAD, Boulevard de Constance 77305 Cedex Fontainebleau, France Ph: (33) (0)1 60 72 44 24 Email: andrew.shipilov@insead.edu

** Associate Professor of Policy at Schulich School of Business, York University 4700 Keele Street Toronto, Ontario M3J 1P3 Canada Ph: 416 7362100 Ext 20516 ; Email: sxli@schulich.yorku.ca

THE MISSING LINK:

THE EFFECT OF CUSTOMERS ON THE FORMATION OF RELATIONSHIPS AMONG PRODUCERS IN THE MULTIPLEX TRIADS

Abstract:

This paper develops a concept of a "multiplex triad" i.e. triplet comprised of actors playing different roles and interconnected by different kinds of relationships. An example of such triad is a social structure comprising two producers connected via horizontal relationships and a customer connected to producers via vertical ties. Multiplex triads are important drivers of network evolution, but their dynamics remains poorly understood. Although conventional wisdom suggests that horizontal ties between producers are driven solely by their prior interactions, we find that vertical ties drive the formation of horizontal relationships in a multiplex triad. We also find that these triads are affected by the agency of the customers who a) force producers into horizontal relationships with those producers that have protected the customers' interests in the past and b) prevent closure in triads containing strong horizontal relationships due to the divergent objectives of these triads' members. By drawing attention to the existence of multiplex triads and their underlying dynamics, this paper advances a novel view on transitivity incorporating conflicting interests and agencies of actors within social systems.

Key words: Partner selection, horizontal ties, vertical ties, customer-supplier relationships.

Dyadic relationships between two organizations are formed when they work together towards a specific goal (Gulati, 1995). While some relationships can be formed de novo, i.e. when there is no prior tie between the two parties, the vast majority of the relationships are replicated (Beckman, Haunschild and Phillips, 2004; Baum, Rowley, Shipilov and Chuang, 2005). Replication of past relationships happens because prior interactions lead to the development of partner-specific routines, which increases the dyad members' collective ability to generate value in the relationship (Gulati, 1995; Li & Rowley, 2002). While these drivers of network evolution have been well documented, most of the studies examining dyadic ties make a simplifying assumption that dyads arise from the two actors being embedded in a single type of relationships. For instance, prior studies examined manufacturers engaging in collaborative relationships for joint R&D with other manufacturers (Gulati and Gargiulo, 1999) or airlines interconnecting within code-share relationships with other airlines to achieve economies of scale (Gimeno, 2004).

However, as Baker and Faulkner (2002) remind us, actors possess qualitatively different relationships with various entities that interconnect them both directly and indirectly (also see Baker, 1990 for related discussions). For instance, an organization can act as a producer and, in so doing, be embedded in a network of "horizontal" collaborative relationships with the other producers. At the same time, the same organization can also be a supplier to customers leading to the emergence of "vertical" relationships with them. For instance, two software development companies might have an R&D alliance between each other as well as be suppliers to a company like Intel or Microsoft (Gulati et al., this issue). In this case, when two producers contemplate a future horizontal relationship, they would have to take into account not only their prior direct horizontal interactions, but also dynamics of vertical relationships that they have with common customers. In addition, customers might seek to influence dynamics of relationships between their producers enabling only those horizontal dyads that are in their interests. For instance, Intel might prompt two software development companies to collaborate with each other on an Intel-specific project, even if these two companies have no prior experience of working together. In this case, the dyadic-level mechanisms in horizontal networks become intertwined with transitive pressures coming from within "multiplex triads", i.e. triplets composed of actors playing different roles and interconnected by more than one kind of relationships. While, traditionally in network research, multiplexity has been conceptualized as different kinds of relationships connecting actors (Granovetter, 1973; Ibarra, 1995), multiplexity in triads could arise from the inclusion of actors playing different roles and their interconnectedness by different

relationships. For instance, a multiplex triad involving a customer and two producers would comprise two vertical ties (those linking individual producers to a customer) and a horizontal relationship (linking both producers). Consequently, if a particular horizontal dyad is a part of a multiplex triad, then dynamics in this dyad will be shaped not only by the history of prior interactions between the two producers, but also by their past interactions with the common customer (Baker, 1990; Gimeno and Woo, 1996).

How are the multiplex triads formed and how do they dynamically evolve over time? Traditional transitivity arguments depict a highly constructive approach taken by third parties to the relationships between their partners. That is, when two partners are indirectly connected via a third party, the latter will seek to close a triad by introducing its contacts to each other and the contacts accept this closure (Granovetter, 1973). This happens because it is assumed that all members of the triad share the same interests, and are embedded in the same relationships. However, in multiplex triads, role and relationship divergence can lead to divergent interests, which could undermine the solidifying effect of transitivity. For instance, if each triad member pursues its own agenda based on its own interests, then information exchange and trust will be replaced by the feelings of suspicion and competitiveness. Under such a condition, transitivity mechanisms in multiplex triads will function in more nuanced ways than have been portrayed in the literature, i.e. triadic closure will not be automatic and will be affected by the clash of competing interests between the triad's members.

Because prior studies have assumed away multiplexity of roles, interests and of relationships between organizations, both the existence and the underlying dynamics of multiplex triads remain poorly understood. That is, we don't know how transitive mechanisms operate within multiplex triads and whether closure could be taken for granted in such social structures. In this paper we address this gap by unpacking the role of transitivity stemming from vertical relationships on the horizontal relationships. Our specific context is the market for underwriting services where investment banks collaborate with each other by participating in syndicates designed to sell newly issued securities sold to investors (Pollock, Porac and Wade, 2004). Conventional wisdom suggests that the key drivers for the future relationships between investment banks are their past horizontal relationships, such that a "lead" underwriter selects "subordinate banks" to join its syndicate (e.g. Li and Rowley, 2002) and in so doing banks act as sole architects of their network with fellow producers. However, just like investment banks are producers who collaborate with each other, they are also suppliers of underwriting services to customers—the issuers of securities (Corwin

and Schultz, 2005). That is, before a bank assembles a syndicate, it has to be given a mandate to do so by the issuer who might have had existing relationships with other banks itself. Consequently, banks become interconnected to each not only via their direct relationships in a network of prior horizontal deal syndication, but also by their vertical ties which expose them to transitive pressures from the issuers.

Our analyses show that past vertical relationships have a much stronger impact on the dynamics of future horizontal relationships than the past horizontal relationships themselves. Moreover, because investment banks compete for the issuers' business even within the confines of the established syndicate, the divergence of their interests introduces tensions into the resulting multiplex triads such that the issuers force lead banks into relationships with those partners that are in the best interests of the issuers, but not in the best interests of the lead banks. Finally, counter to the conventional logic of triadic transitivity, we find that greater strength of vertical and horizontal ties underlying a triad leads to the lower probability of this triad's closure.

This paper seeks to make two interrelated contributions. First, our conceptualization of a multiplex triad provides a different vantage point from which to examine network transitivity (Baker and Obstfeld, 1999; Gargiulo, 1993). That is, prior research assumes collaborative nature of relationships in conventional triads, which ultimately suggests that the majority of triads over time should become closed. However, empirical evidence is not consistent with this assertion, although theoretical explanations for the lack of complete closure are lacking (Madhavan et al., 2004). We propose that part of the answer as to why some triads remain open while the others close is the divergence of their members' interests because of different types of relationships in which these actors are embedded. For example, a customer might force a producer to form relationships with specific producers, depending upon the extent to which connections between these producers are in the customer's best interests. Consequently, incorporating the notion of multiplex triads into the theoretical apparatus of network research yields a more dynamic picture of relationships' transitivity not as a taken-for-granted phenomenon, but rather as a contentious process shaped by the divergent interests of different actors.

Second, our paper highlights the importance of examining the impact of vertical ties on the formation of horizontal relationships as well as of isolating the agency of customers in the formation of horizontal relationships. Prior studies of horizontal relationships have over-emphasised the role of prior interactions between the producers on the formation of future horizontal relationships while overlooking

the role of their vertical relationships with customers (e.g. Baum, Shipilov and Rowley, 2003; Li and Rowley, 2004). At the same time, research on vertical relationships has examined their internal dynamics and performance implications for suppliers and their customers (Helper and Levine, 1992; Hoetker, Swaminathan, and Mitchell, 2007), however it did not examine the impact of past vertical ties on the formation of horizontal relationships nor it was able to compare this impact to the influence of past horizontal relationships. Addressing these issues should allow us to develop more complete models of network dynamics as well as to improve our understanding of the origins and driving forces behind the network positions of organizations.

THEORY

A network of relationships across organizations is consequential for a number of salient outcomes, such as the survival of organizations (Baum et al., 2000), their return on investment (Rowley et al., 2000), market share (Baum et al, this issue; Shipilov, 2006; Shipilov and Li, 2008) and innovativeness (Ahuja, 2000). Students of organizations view positions in a network as one type of competitive advantage (Gulati et al., 2000). This advantage is based on "network resources", which are rare and sustainable, because each organization's network position has been formed through an idiosyncratic process (Gulati, 1998; Gulati et al., 2002; Hagedoorn, 2006).

The web of relationships in which an organization is embedded influences how this organization builds its future relationships (Baum et al., 2005; Beckman et al., 2004; Gulati, 1995). Organizations engage in repeat partnering because the frequency of past ties spurs the development of collaborative routines. The existence of these routines underlies two distinct mechanisms responsible for the repeated ties: inertia and partner evaluation (Li and Rowley 2002). Inertial pressures are reflected in organizations' propensity to repeat past relationships because, over time, past partners tend to develop partner-specific routines enabling information transfer, problem-solving arrangements and trust in a dyad (Uzzi, 1996). As Schreiner, Kale and Corsten (2009) point out, as a result of their experiences with partners, organizations develop alliance management capabilities that could be conceptualized along three related dimensions—coordination, communication and bonding. The dimension of coordination comprises ability of the organizations to develop working procedures with their partners; communication comprises the ability of organizations to share information with partners in a timely fashion, while bonding refers to capacity of organizations to develop social bonds with their partners. The first two capabilities are underpinned by the existence of

collaborative routines, while the third one is underpinned by the existence of social norms and mutual obligations as a result of past partnering. Another advantage of repeated ties is that they leave traces of performance history. Examining the past performance of relationships allows organizations to evaluate which routines worked with a given partner and which ones did not. Repeat partnering also allows organizations to evaluate their partners' ability and willingness to convert information transfer, problem solving arrangements and mutual trust into tangible value creation outcomes.

Evidence of repeated dyadic partnering abounds in a variety of contexts, such as alliances in materials, industrial automation and automotive products industries (Gulati and Gargiulo, 1999), post-IPO acquisitions (Arikan and Capron, forthcoming) or syndicates in the investment banking industry (Baum, Rowley, Shipilov and Chuang, 2004). However, when examining the determinants of dyadic relationships, many studies make a simplifying assumption that dyads arise from their members playing a single role (e.g. that of a producer (Podolny, 1993; 1994)), and as a result they are embedded in a single type of relationships only. However, in reality, organizations play multiple roles and, consequently, they are embedded in multiplex relationships (Baker and Faulkner, 2002; Jensen, 2003; Gulati and Westphal, 1999; Gimeno and Woo, 1996). For example, organizations act as buyers of inputs from their suppliers and act as producers of value from these inputs to their customers.

The recognition of role and relationship multiplicity is important, because organizations become connected to their partners not only directly, but also indirectly through common partners connected to them via other kinds of relationships. For instance, two producers can be linked to each other not only by horizontal relationships as a result of their prior direct collaborative experience, but also through vertical buyer-supplier ties to a common customer. Research on vertical relationships has demonstrated that such ties are consequential for the survival of suppliers (Hoetker et al, 2007), their ability to reduce product defects (Dyer and Hatch, 2006; Helper, MacDuffie and Sabel, 2000) and that long-term buyer-supplier relationships help companies achieve competitive advantage (Helper and Levine, 1992; Helper, MacDuffie and Sabel, 2000). However, this research examined dynamics within vertical relationships only, while overlooking a possibility that vertical ties with customers might drive horizontal relationships between producers. Because vertical relationships are likely to represent a substantial source of unobserved heterogeneity in the models of horizontal relationships' evolution, this calls for a detailed examination of the impact of vertical ties on the dynamics of horizontal relationships.

Multiplex Triads

When a direct relationship between two actors is influenced by their ties to the third party, the focus of analysis needs to shift from examining relationship between these two actors as a dyad to examining this dyad as embedded within a triad (Baker and Faulkner, 2002; Madhavan et al, 2004). Although triads have been a cornerstone of early network research (Davis, 1979), their role and underlying dynamics still remain poorly understood in the inter-organizational context (Baker and Faulkner, 2002). Triads are thought to be influential for the formation of relationships due to the transitivity principle (Granovetter, 1973). Specifically, if two actors share a common third party, the probability of these two actors to form a direct relationship is amplified because the third party acts as an indirect communication channel between the two actors that can transmit information about their skills and capabilities (Vissa, this issue). Moreover, when the direct link between two actors is formed, the common third party acts to cement that link by playing the role of an independent arbiter (Krackhardt, 1998). While in an inter-personal network the third party brings its contacts together because it seeks to reduce psychological imbalance that arise from experiencing disconnections (Heider, 1964), in an inter-organizational network the third party brings its contacts together to achieve joint value creation, such as economies of scale (Madhavan et al, 2004). At the end, the contacts are also induced to accept these invitations of the common third party to start direct collaboration between each other.

These arguments have been corroborated across different kinds of networks. For example, one study of work teams finds that individuals feel psychological discomfort when their partners are not connected and seek to close this gap (Krackhardt and Kilduff, 1999). Similar results are reported in the study of scientific collaboration networks (Newman, 2001) i.e. those scientists who have had common co-authors were more likely to collaborate over time than those who did not have common co-authors. In the study of strategic alliance formation in the global steel industry, Madhavan et al (2004) demonstrate the existence of transitive triads among firms within the same geographical regions and within the same technological classes. In the context of inter-organizational relationships, Gulati and Gargiulo (1999) also document the heightened probability of relationship formation between organizations which share a common partner. Consequently, it seems reasonable to suggest that triadic transitivity should reinforce path dependent pressures within dyads, that is the higher is the frequency of prior collaborations between two actors and the stronger is the relationship that these actors maintain to their common third party, the

more likely should these two actors be to continue collaboration with each other simultaneously with collaborating with the third party. In other words, given convergence of the actors' interests, triads comprising actors that have strong relationships between each other are likely to be closed.

Similar to the research on dyadic replication, research on transitivity tends to assume that triads are created when their members play the same social roles and role similarity drives shared interests and cooperativeness within the triad. When this is the case, organizations are embedded in triads consisting of relationships of a same kind. However, this dynamic would be very different in a "multiplex" triad – a social structure comprised of three members playing different roles and being interconnected with different relationships, and, as a result, having different interests. This definition takes the notion of multiplexity (Granovetter, 1973; Ibarra, 1995) to a new level. Dyads are considered to be multiplex when they comprise different kinds of relationships between the partners playing the same role, such as two producers simultaneously having R&D, marketing and distribution producer-producer alliances between each other. In contrast, triadic multiplexity arises from the triad members' playing different roles and being connected by different kinds of relationships, i.e. two producers linked by horizontal, producer-producer ties and, at the same time, being connected to a common customer via vertical, buyer-supplier ties. What is particularly interesting about multiplex triads is that individual dyadic relationships that make them up comprise a single type of tie: the producers are inter-connected via a horizontal tie only while these producers are connected to the customer via vertical ties; however, collectively these relationships create a social system that has a property of multiplexity even though its underlying elements are uniplex.

Multiplex triads are characterised by the simultaneous *divergence in actors' roles* as well as the *divergence in the types of relationships* through which these actors are connected. When a multiplex triad contains two members of the same role vying for the business of the third member playing a different role, this will lead to the divergence of interests inside the triad. Such dynamics would arise in the triads comprising two producers and a customer (two producers compete to sell their output to a customer) as well as in triads comprising two customers and a producer (customers compete to acquire the producer's output). In this case, the more substitutable are the two role equivalent members of the multiplex triad from the standpoint of the third member, the more they will compete for the third member's business, leading to the divergence of interests in this triad. For example, in a triad involving a supplier of PC components (e.g. Intel) and two PC manufacturers (e.g. Dell and Acer), the interests of manufacturers are likely to differ as they compete

for the next generation components from the supplier, hence any horizontal relationships between these manufactures are likely to be unstable.

A triad might contain three members playing three different roles—a customer, a producer and a supplier--with each member being interconnected by a vertical relationship; but in this case this triad will not be multiplex. In such triad, the divergence of roles is unlikely to lead to the divergence of members' interests because none of the triad's members are role equivalent to another and they need each other's collaboration to create value. For instance, a producer will need inputs from supplier to serve its customer, a customer needs producer to receive inputs from its supplier so that the output is produced, and the supplier needs the producer to be able to sell the final product to the customer. This is why, for instance, it is in the best interests of PC manufacturers that their suppliers like Intel collaborate with the customers of PCs to identify unmet needs (e.g. mobile computing), such that these needs can be addressed in the new generations of processors (e.g. chips with wireless communication support), which in turn would drive the sales of new PCs. It is also in the best interests of customers that they communicate these needs to Intel, such that they could have new PCs functionalities from manufacturers. Consequently, the stronger are the relationships within this uniplex triad, the more likely is this triad to be closed and self-perpetuating.

The traditional account of transitivity, applicable to the dynamics within uniplex triads, is mute on the relationship dynamics in multiplex triads, however. For example, it is not clear, what role vertical relationships play in the closure of these triads, i.e. how and why ties to customers influence horizontal relationships between producers and whether vertical ties have a stronger effect than the past horizontal ties on the future horizontal ties. Neither do we know whose agency—that of the customer or that of the producers -- drives horizontal relationships, nor whether strong vertical relationships hamper or facilitate closure in multiplex triads involving strong horizontal ties. In the rest of the paper we unpack these mechanisms by first describing their dynamics in the financial market for new securities, the context of our study. Then we advance specific hypotheses examining the interplay between past vertical and past horizontal relationships on the future horizontal relationships in multiplex triads.

Multiplex Triads in the Market for Securities offerings. When an issuer (customer) decides to sell its securities to investors via a public offering, this triggers a complex system of interactions involving the bank selected to lead the public offering (lead producer), the other banks selected to join an underwriting syndicate (subordinate producers) and investors, who are the ultimate buyers of the new securities (Pollock,

Porac and Wade, 2004). The issuer requests the services of investment banks, because in the presence of information asymmetry, it is inefficient for the issuer to approach potential investors on its own (Baker, 1984; Halpern, 1996).

The multiplex triads in this market are formed as a result of a two step process where the issuer first selects a bank to lead its offering and then the other investment banks get invited into the syndicate. Figure 1 illustrates such dynamics by depicting horizontal relationships among investment banks (illustrated by solid lines) and vertical relationships arising as a result of underwriters providing services to issuers (illustrated by dashed lines). At time T1, issuer *z* has a vertical tie to bank *j* because it chose that bank to lead its prior offering (as a sole underwriter, for simplicity of an example). At time T2, the issuer chooses another bank, *i* to lead its next public offering but requests that bank *j* is also included in the syndicate. Consequently, a vertical tie between an issuer *z* and bank *j* in time T1 could lead to the formation of a horizontal tie between banks *i* and *j* in time T2, even though the issuer is not a member of the horizontal tie network, and the tie between the issuer and *j* is not a tie in the horizontal tie network either.

--- Insert Figure 1 about Here---

The principal objective of all players involves the completion of the public offering process and creation of the market for the newly issued securities. Long-term price increase of the securities is also in their best interests. Banks achieve this objective by providing research coverage of the new issue, buying and selling this issue on their own account as well as distributing them to investors (Dunbar, 2000; Ellis et al, 2000). These commonalities of goals between the PO market participants have been considered at length in several studies (e.g. Pollock, Porac and Wade, 2004; Ellis et al, 2000) and we summarize them in Table 1. This table provides a pairwise comparison of interests between different participants in the PO marketplace with the areas of cooperation between participants being listed below the diagonal.

--- Insert Table 1 about Here ---

The areas of competition between syndicate members have attracted somewhat less attention in the management literature than their areas of collaboration, here we outline them in greater detail and list them above the diagonal in Table 1. The key contention between the issuer and the lead bank is the pricing of the newly issued securities. When an issuer brings its offerings to a PO market, it prefers to receive the largest possible proceeds from the offerings' sale (Draho, 2004). However, the issuer tends to receive a lower price for its offering as compared to the price at which this offering is being resold by investors,

resulting in the phenomenon called "underpricing" (Ljungqvist 2007; Arthurs, et al 2008). The higher the underpricing, the more money the issuer has left on the table for the investors (Siconolfi, 1996) to the chagrin of the issuer [1]. However, from the standpoint of the lead bank, high levels of underpricing could be lucrative, because underpricing allows the bank to build relationships with the investors by offering them shares at a discount in the hope of attracting them to future share placements (Arthurs, et al 2008). In addition, underpricing is also used by the lead bank to extract other favours from the investors. In line with this argument, one recent study reports that new trading commissions which investment banks get from mutual funds constitute up to 85 cents per dollar of underpricing of offerings which the banks sold to these mutual funds in the past (Reuter, 2006). Another study suggests that banks allocate deeply discounted shares to the executives of companies from whom they plan to win business in the future (Ljungqvist, 2007), clearly putting the interests of these banks in opposition to the interests of the issuers.

Syndicate members often help the issuer in negotiating the price of the offering by providing it with arguments to be used against the lead bank and often explicitly incentivize the issuer to be more aggressive in pricing negotiations (Corwin and Schulz, 2005). Their motivation to do so is driven by the mismatch between their interests and those of the lead bank. That is, subordinate syndicate members might want to become the future lead banks itself, and because the issuers tend to return to the market a number of times, syndicate members would seek to earn issuer's favours by helping it in pricing negotiations within the current syndicate. Another practice of undermining the lead bank's position involves "flipping" by syndicate members, namely dumping or stopping buying the securities at the early days of its trading (Draho, 2004), which usually leads to a decrease in the offering's short term price. While subordinate banks also have shares to sell to their own investors, they constitute much smaller proportions of the offering as compared to those allocated to the lead bank, ultimately making subordinate underwriters less likely to benefit from the issue's underpricing (Pichler and Wilhelm, 2001), contrary to the interests of the lead bank and those of the short-term investors.

Vertical Ties as the Drivers of Horizontal Ties. Because such instances of syndicate members' non-cooperation could hamper the lead bank's performance, it routinely relies on its past relationships with

[1] One study reports that the history of an investment bank's underpricing led to a loss in its market share because issuers punish that bank for forcing them to leave too much money on the table (Dunbar 2000). Another study finds that when managers of the issuing company can monitor the transaction they try to keep underpricing as low as possible (Ljungqvist and Wilhelm, 2003).

other underwriters to identify reliable partners (Li and Rowley, 2002). This is why a recent study has found that over 90% of horizontal relationships between banks involved partners that either collaborated directly or were connected by an indirect tie via another bank (Baum, et al., 2005). However, in a multiplex triad, vertical ties with a customer will too influence horizontal relationships. When a customer enters the mediated markets more than once, it develops collaborative routines with producers leading its offerings in the past, that underlie its ability to coordinate and communicate with these producers in the future (Schreiner et al, 2009). An increase in the strength of a vertical tie would ultimately drive transitive closure of multiplex triads involving the customer, the lead producer and the subordinate producer with a vertical relationship to a customer. In the specific context of the market for public offerings, the information transfer and joint problem-solving arrangements developed as a result of a bank's prior interactions with the issuer will make it easier for that bank to understand the specific issuer's needs. This will facilitate the bank's ability to serve this issuer in the future. Consequently, the existence of these routines underlying a vertical tie will incentivize the issuer to include that bank in its future syndicates, even in the capacity of a subordinate member. Similarly, the investment bank leading the new offerings of the same issuer might also want to form ties to those banks that underwrote the issuer's offerings in the past, either to capitalize on their first-hand knowledge about the issuer or to get access to the issuer's business. In other words, the strength of a prior vertical tie between an issuer and a bank will drive future horizontal relationships between that bank and a lead underwriter ultimately resulting in the transitive closure of a multiplex triad. More formally:

Hypothesis 1: The strength of past (issuer-bank) vertical ties will increase the probability of formation of a future (bank-bank) horizontal tie formation.

Which ties – vertical or horizontal – have more impact on the probability that a given producer is selected as a subordinate member of the syndicate for a given customer? In other words, which ties are responsible for the closure in the multiplex triad? In the context of the market for public offerings, prior horizontal relationships lead to the development of collaborative routines between the prospective syndicate members underlying their communication and coordination activities in inter-organisational relationships (Schreiner et al, 2009). Because horizontal ties are more frequent than vertical relationships, inter-bank routines are likely to be more refined than those formed within the confines of vertical relationships between the bank and the issuer. Despite this refinement, routines stemming from horizontal

ties have been developed in prior offerings that are usually very different from a syndicate involving the offering from a current, specific issuer, because these routines emerge from two banks serving the aggregate of their past customers. Consequently, such routines will enable the exchange of very generic information only between the banks, but the information is not very relevant to this current customer. Similarly, such routines will enable banks to solve generic problems, as opposed to solving the customer-specific problems. For example, two banks may exchange information on how to make transactions in the oil industry, which types of investors are interested in oil stocks as well as to how to appropriately value the oil reserves. In contrast, having vertical relationships with a specific issuer – an oil company, provides a bank, i.e. a prospective syndicate member, with routines enabling information exchange and problem solving specific to that issuer. As a result, this bank will know the unique aspects of the issuer's business model and be privy to issuer-specific information. Such information might include, for example, insights into the plans for oil exploration developed by this specific oil company or how to value its oil reserves, which then would be factored into the suggested price for the old company's newly listed securities.

While the frequency of prior partnering between firms generates routines for communication and coordination, the conversion of these routines into future ties will depend on their relative bargaining power vis-à-vis each other, given their divergent roles and interests. When multiplex triads are comprised of two producers and a customer, the customer would have the leverage in this triad to the extent that different producers independently vie for the customer's business (Swedberg, 1994). In the context of the PO market, the issuer always has alternative banks to turn to for leading its public offerings due to this market's highly competitive nature, including those underwriters who are currently acting as subordinate syndicate members; therefore the lead bank would have to comply with the issuer's demands. Because routines underlying communication and coordination between the issuer and a prospective syndicate member would be more salient for that issuer than the existence of general collaborative routines between a lead bank and that syndicate member, ties between a bank and an issuer are likely to be stronger predictors of the inclusion of that bank the into a future syndicate than prior ties between that bank and the lead.

Hypothesis 2: Past (issuer-bank) vertical ties have a stronger influence on the formation of future (bank-bank) horizontal ties than past (bank-bank) horizontal ties

Customer's Agency in the Multiplex Triad.

Divergent interests between the customers and producers will manifest themselves in their

divergent perspectives about what constitutes "good" performance of a prior relationship. To the extent that the customer repeatedly returns to the public offering market for selling its securities, the performance of its prior relationships with the producers provides it with criteria to evaluate the quality of services which producers can provide (i.e. how much money did the customer get from a previous sale of an issue underwritten by a specific lead bank). On the basis of this evaluation, the customer can decide whether or not producers with whom it collaborated in the past should be included in subsequent deals. While the lead bank favours relationships with a partner who has achieved substantial underpricing of the issuer's offering in the past, the issuer favours relationships with those underwriters that did not underprice its offering in the past. This conflict remains regardless of the underpricing history that the bank leading the current offering has had with the issuer. From the standpoint of the lead bank, ability of its partner to achieve high underpricing is desirable because its partner knows how to extract value from the issuer. Moreover, if a potential syndicate member has highly underpriced the issuer's offerings in the past, it will be less likely to claim that the current lead is wrong in giving the issuer a low price in the current offering. In turn, from the standpoint of the issuer, high underpricing in the past deals means that its interests have not been served well, the complaint which some issuers even use as a basis for legal proceedings against underwriters (NewsWire, 2003). Having a subordinate syndicate member that gave the issuer higher launch price in the past allows the issuer a source of checks and balances against the pricing decisions of the bank leading its current syndicate, as such subordinate syndicate member is likely to provide the issuer with arguments for increasing the launch prices in negotiations with the lead (Corwin and Schulz, 2005). Because the customer has power when multiple role equivalent producers compete for its business, the lead bank should be forced to form horizontal ties to those underwriters that have provided the issuer with lower underpricing in the past. More formally:

Hypothesis 3: A bank is more likely to be included in a future horizontal (bank-bank) tie when it achieved low underpricing in the past (bank-issuer) vertical tie

It is important to contrast argumentation in this hypothesis with arguments from the literature on status suggesting that because producers' status is the overriding concern for customers, the higher is the producer status, the more should the customers want to work with it (Podolny, 1993; 1994). That literature defines status as a signal of quality when the underlying quality of the producers is not observed (Podolny, 1993). Indeed, when there is no performance track record between the customer and a producer, i.e. *before*

their first interaction, the customer's decisions might be guided either by the status of the producer or by other signals of a producer's underlying quality. However, theorizing advanced in Hypothesis 3 reflects decisions of the customer *after* it has interacted with a producer and observed first-hand the quality of the producer's services (i.e. the amount of money a customer gained from the public offering vs. the amount of money it was forced to leave to investors). Consequently, when the quality is already observed, status-based clues become replaced by actual performance-based clues (Washington and Zajac, 2005), which in the context of the market for public offerings means the issuer making selection decisions on the basis of producers' underpricing of the issuer's past offerings.

Strength of Ties and Triadic Closure.

Traditional arguments suggest mutually reinforcing tendencies between dyadic tie formation and transitivity (Gulati, 1995; Gulati and Gargiulo, 1999). However, because members of a multiplex triad have different interests, the increase in the strength of past vertical and horizontal relationships would decrease the probability of this triad's closure. Recall from Table 1, that in the market for public offerings, many subordinate syndicate members strive to lead the issuer's future offerings and it is in their interests to secretly undermine the lead bank's position in the current offering. The interests of issuer over the pricing of the offering also differ from those of the lead bank, i.e. the issuer demands lower underpricing while the lead bank favours higher underpricing. Such divergent interests, according to a recent study, lead to non-overlapping information flows within a syndicate—as the lead bank negotiates syndicate terms with the issuer, the issuer verifies this information with some of the other syndicate members and uses the suggestions from the syndicate members to undermine the lead bank's position during subsequent negotiations (Corwin and Schulz, 2005: 448). In other words, even in a closed multiplex triad, the issuer can capitalize on the divergence of its members' interests by maintaining a "virtual" structural hole between the two banks such that the issuer uses the information procured from one underwriter to extract value from another underwriter.

In order to extract better deal terms from the lead bank as well as to enforce these terms throughout the duration of the public offerings, the issuer has to maintain a strong vertical relationship to the subordinate syndicate member such that their continuous information exchange is facilitated by the existing collaborative routines. Simultaneously, the issuer must be certain that the lead bank and the subordinate syndicate member have either no or weak horizontal relationships between each other. When

this is the case, the issuer would expect the syndicate member not to share information (received through a vertical tie) with the lead bank. Moreover, given the weakness/absence of a horizontal tie, the issuer would expect that the subordinate bank is not bonded with the lead underwriter as a result of the horizontal collaborative experiences (Schreiner et al (2009), hence the issuer can trust the information received from the subordinate syndicate member. In contrast, when the two banks are connected via a strong horizontal relationship and there is a strong vertical relationship between the issuer and a subordinate bank, there is no "virtual" structural hole between the producers for the issuer to exploit, as the producers have bonded with each other from the past deals. Furthermore, in this case, the issuer would fear that the lead bank will become privy to sensitive information exchanged via a strong vertical relationship involving the issuer and a subordinate bank, ultimately undermining the issuer's relational advantage. Examples of such information might include insights into the weaknesses of the issuer's business model or into the issuer's negotiations behaviours in prior deals. If a subordinate bank can access this information as a result of having a strong vertical tie with the issuer, and it communicates this information to the lead bank via a strong horizontal tie, the latter can use it to force concessions from the issuer.

Given potential complications arising from a combination of strong vertical and horizontal relationship, the issuer would seek to avoid forming such multiplex triads. Instead, it will seek to include those underwriters to which it has bonded to via strong vertical ties and which, in turn, have not bonded with the lead underwriter. Because the wishes of the issuer drive the formation of relationships in a multiplex triad, the lead bank would have to agree to the inclusion of those underwriters. In other words, if our arguments above are correct, the strength of underlying dyads should undermine closure in a multiplex triad. More formally:

Hypothesis 4: There is a negative interaction between the strength of past (bank-bank) horizontal ties and the strength of past (issuer-bank) vertical ties on the probability of a future (bank-bank) horizontal tie formation

METHODS

Our data collection involved compiling information for public offerings (POs) of common stocks on all stock exchanges in the US between 1 January 1980 to 31 December 2001 from the data made available by the Securities and Exchange Commission (SEC) and complied by the SDC Platinum Database of Thompson Financial. In addition to collecting data on the relationships between investment banks

underwriting POs and the characteristics of PO deals in which they participated, we also collected information on the identity of issuers on behalf of whom these deals were constructed. That is, for each PO, we were able to identify the corresponding issuer and examine the characteristics of relationships that banks maintained with the issuer in the past. To get a better understanding of the dynamics in this industry, we also interviewed 32 investment bankers who had both recent experience in this industry as well as those who had worked in the industry in the 1980s and 1990s. Our respondents had a minimum of 7 and a maximum of 20 years' experience in the industry, with their current titles ranging from vice-president to senior managing director. All of our respondents had experience in organizing POs. We also familiarized ourselves with the investment banking industry by conducting extensive research in the business press, reading hundreds of articles and industry reports published in the finance journals, newspapers and trade magazines between 1981 and 2001.

In our qualitative interviews, guided by the existing literature, we were initially interested in understanding the criteria on which lead investment banks selected their syndicate members. However, we soon had to change the direction of our inquiry, because a typical response to our question of "Tell us how lead banks construct the syndicate" was "What do you mean? It is the client that has the major say in the construction of the syndicate, not the lead bank." This alerted us that we had to inquire about the relative roles that the issuers and the lead banks played in the syndicate formation. In response, the majority of bankers said that the most important influence would be the wishes of the client (issuer) and the preferences of the lead bank are heeded only after the interests of the customer are accounted for. In turn, investment banks had to "pay the client to play", in other words provide it with services such as M&A strategy consulting or buy a large proportion of the client's prior POs, so that the client starts considering them as syndicate members in the future. When it came to assessing the role of relationships between the lead bank and the other banks in forming the syndicate, we were told that personal preferences of the bankers leading the PO played a role with respect to selecting specific syndicate members, when the issuer was ambivalent with respect to the choice of a specific syndicate members. For instance, one banker told us that banks grew beholden to each other as a result of working on multiple deals together and consequently they would recommend the issuer each other's inclusion into the future syndicates as well. Individual bankers enforced the norms of reciprocity in their dyads, for example, by keeping spreadsheets documenting how many PO deals they referred to their colleagues in another bank and how many deals

their colleagues have referred back to them. Many respondents told us that they made recommendations for the clients to select a specific underwriter into their syndicate on the basis of "personal chemistry" between bankers. But again, we were told that the influences of the clients were more important than the influences from the lead bank in the formation of syndication relationships between the banks.

Statistical analyses

As in previous studies, examining the probability of one organization forming a relationship with another, we faced a potential problem of non-independence among the observations. Because each bank initiating a PO syndication tie entered the analysis several times, it could result in the systematic underestimation of standard errors for bank attributes that did not change across dyads. Following Jensen (2003), we used matched samples and rare events logistic regression analysis to ensure that the large numbers of repeated occurrences of each bank did not result in this underestimation. Since the realized dyads provide most of the information for the estimation of the factors that affect dyad formation (King and Zeng, 2001), we included all the horizontal PO dyads in which a bank was a lead manager (ones) in the final sample (a total of 27,045 dyads). Of 27,045 realized dyads, 14,508 were relationships created to place a seasoned (repeated) PO on the market between 1984 and 2001[2]. We then combined the sample of realized horizontal dyads with a random sample of potential horizontal dyads that were not realized (zeros), in other words, a sample of dyads in which the focal lead manager did not invite another bank into its syndicate. We collected five times more zeros than ones. Specifically, to 14,508 realized seasoned PO dyads, we added a sample of 72,540 unrealized dyads, leaving us with 87,048 horizontal dyads on which to perform our analysis. This approach alleviated the non-independence problem by reducing the number of times the average bank entered the overall sample of horizontal dyads. We reported robust standard errors adjusted for clustered observations (Rogers, 1993; White, 1980) and we employed Relogit STATA procedure (Tomz, 2001).

Another complication was the existence of an endogenous process of forming POs networks. Specifically, before a horizontal tie between two banks is constructed, the issuer of a PO must select one bank to be its lead from the pool of investment banks. In other words, formation of vertical ties precedes the formation of horizontal relationships. Consequently, prior to analyzing the dataset comprising horizontal ties among investment banks, we also constructed an issuer-by-bank (vertical ties) dataset, where

[2] Because we conduct our analysis aggregating data into 4 year windows, we used network information for 1980, 1981, 1982 and 1983 to predict dyad formation in 1984, but we did not have 4 year windows to predict dyad formation in 1980, 1981, 1982 and 1983 respectively.

each realized vertical dyad between a bank and an issuer (26,903) was compared to five non-realized vertical dyads between an issuer and other banks (134,515). From this dataset, we computed an inverse Mills' ratio reflecting the probability that a specific bank will be selected by an issuer to act as a lead for the issuer's PO, and then included this ratio as a control variable in the analyses examining the determinants of the lead bank's horizontal tie formation.

Dependent and independent variables

Taking an issuer's offerings public is a process that involves several major stages, including registration, due diligence and marketing (Ellis et al., 2000; Pollock et al., 2004), and underwriting syndicates are put together well before the date of the offering. To capture the dynamics among syndicate members prior to the offering date, all our variables described below reflect relationships not within individual years, but within four-year periods (e.g., 1980-83) similar to the approach taken by Baum, et al (2004). We used four-year windows for three reasons. First, syndicate ties represent only the visible manifestation of relationships; lead and subordinate banks participating in syndicates together in any given year are also likely to interact in other ways with each other in years proximate to the syndicate. Second, because syndicates can remain intact up to six months or more prior to the date of the offering, syndicates that conclude in any given year may have been formed in prior years. And third, the four-year window permits us to gauge more accurately the strength of vertical and horizontal network ties by incorporating information on repeated ties over a number of years. Constructing the network based on four-year moving periods thus permits us to represent the network more reliably and accurately, especially since many customers are unlikely to repeat POs in an annual basis, but instead enter the market once in several years time.

Our dependent variable was an investment bank's choice of members in its PO syndicate. This was a dichotomous variable (*PO Tie (ijz)*) coded one if bank *i* formed a tie with another investment bank *j* to place an offering for issuer *z*, and zero otherwise. The independent variables were lagged one time period as compared to the dependent variable to avoid simultaneity problems. So, if in our dataset, the independent variables were recorded in period *t*, the dependent variable was recorded in period $t + 1$.

Our independent variables comprised indicators of banks' embeddedness with the issuers (vertical ties) and the track record of these banks' underpricing offerings for the given issuer in the past. To test Hypothesis 1, we constructed variable *Vertical Ties with Issuer (jz)* as the number of deals that a potential

subordinate bank *j* lead for the issuer *z* in the past four years. Such measures based on the frequency of past interactions between the actors have been shown to be good indicators of the strength of inter-actor relationships (Hansen, 1999). We expected a positive and significant effect for this variable if Hypothesis 1 were supported. To test Hypothesis 2, we had to compare the effects that *Vertical Ties with Issuer (jz)* would have with a variable capturing the embeddedness of an investment bank *j* in a horizontal network of relationships with the lead bank *i*. We created a variable called *Prior Horizontal Ties (ij)* to indicate the number of times banks *i* and *j* together participated in the same underwriting syndicate with either *i* or *j* leading that syndicate. Both network tie variables -- *Vertical Ties with Issuer (jz)* and *Prior Horizontal Ties (ij)* -- were logged. Hypothesis 2 proposes that, in the *post hoc* analysis, the effect of *Vertical Ties with Issuer (jz)* should be significantly stronger than the effect of *Prior Horizontal Ties (ij)* on the probability of a future horizontal tie between banks *i* and *j*.

To test Hypothesis 3, we constructed a variable *Underpricing in Vertical Ties (jz)*. This variable was adopted from the financial literature, and it captured how strongly underwriting syndicates formed by bank *j* on behalf of client *z* underpriced this client's offerings (Benveniste and Spindt, 1989; Hanley, 1993). To compute this variable, for each PO that bank *j* led for the issuer *z*, we compared the midpoint of the offering's filing price range in a primary prospectus with the offering's final price using the following formula:

Offer Underpricing (jz) = (Launch price (jz) – Average Filing Price (jz))/Average Filing Price (jz), (1)

where *Launch price(jz)* was the actual price at which the offering was sold to the investors and *Average Filing Price (jz)* was the average of the filing price range predicted by the underwriters in the offering's prospectus. For example, if the PO's price range was set in the issuer's prospectus at \$13-\$15, then \$14 was the average filing price. If the actual launch price was \$16, the outcome was calculated as 0.143 (= (\$16 –14)/\$14). As finance scholars suggest, a high value on this variable signals that offerings organized by bank *j* on behalf of issuer *z* were oversubscribed by investors before the launch, because they felt that the offering was underpriced and that issuer was leaving a lot of money on the table (Benveniste and Spindt, 1989; Hanley, 1993). We averaged the outcomes for offerings which bank *j* led for issuer *z*, and denoted this average as *Underpricing in Vertical Ties (jz)*. A significantly negative coefficient on this measure would suggest that banks are included into a syndicate because they did not underprice the issuer's offerings in the past. Since lack of past underpricing will be advantageous only to the issuer, a negative coefficient would ultimately indicate its

influence on the syndicate tie formation (Hypothesis 3).

Finally, to test Hypothesis 4, we constructed an interaction between *Vertical Ties with Issuer (jz)* and *Prior Horizontal Ties (ij)*. A negative effect of this interaction provides support for Hypothesis 4.

Control variables

We computed a range of control variables indicating (1) decisions of an issuer to select a specific underwriter as a lead bank for its POs (formation of vertical ties) and (2) selection of subordinate banks for the syndicates (formation of horizontal ties).

Stage 1: Issuer Selecting the Lead Bank. A dependent variable for the first stage analysis was labeled *Issuer-Lead Bank Tie (iz),* set to one if issuer *z* selected a bank *i* to lead its PO, and zero otherwise. Control variables used in this stage of analysis are summarized in Table 2.

--- Insert Table 2 about Here---

After conducting a logistic regression analysis to estimate the probability of an issuer selecting a specific bank to be the lead underwriter of its PO, we calculated the probability of each bank being selected as the lead bank and then included the inverse Mills' ratio from this calculation as a control variable in the second-stage analysis, which predicted the formation of a horizontal syndicate tie between a lead and a subordinate bank.

Stage 2: Lead Bank Selecting Subordinates. The influences on the formation of the horizontal relationship between the lead bank and a subordinate bank might arise from their experiences and embeddedness in a horizontal network, particularly in terms of the frequency or intensity of their interactions in the horizontal network, banks' status similarity in PO and M&A networks, banks' joint ability to underprice offerings for issuers other than the issuer of the focal POs, as well as market demand factors affecting all banks active in the PO market. Control variables used in this stage of analysis are summarized in Table 2 as well. Note that all our models in this stage also include dummies capturing the fixed effects of the industry in which a particular PO took place. We experimented with using 1 or 2 digit SIC codes for constructing these dummies. Because the results were the same, below we report the output of more parsimonious models that contain industry dummies constructed using 1 digit SICs codes.

Analysis and Results

Since our analysis consisted of two stages, we report two sets of correlation tables and results: one for the issuer-led bank dataset (vertical ties), used to calculate the probability of an individual bank being selected by an issuer to lead its POs, and another for the dataset consisting of realized and non-realized dyads between banks themselves (horizontal ties).

Table 3A reports descriptive statistics and correlations between variables predicting the probability of an issuer selecting a lead bank for its offering. These correlations are small in magnitude, and do not provide indications of multicollinearity problems. Table 3B contains correlations and descriptive statistics for variables used in the second stage of the regression analysis. They, too, are generally small or medium in magnitude, except for the correlation between the *Industry PO Volume* and *Industry M&A Volume*. This correlation is to be expected, because volumes in PO and M&A markets move in lockstep as a reflection of the economy's financial health and the optimism of the market participants.

--- Insert Tables 3A and 3B about Here---

Table 4A reports results of a rare events logistic regression, predicting the probability of a client selecting a specific bank as the lead manager of its PO. Model 1 in Table 4A includes control variables reflecting the characteristics of banks' relationships with issuers, as well as banks' own characteristics. The resulting inverse Mills' ratio has been used as a control in the 2nd stage analysis.

--- Insert Table 4A about Here---

Table 4B contains results of a rare events logistic analysis predicting the probability of a lead bank inviting another bank to act as a subordinate underwriter for a syndicate created on behalf of a given issuer. Baseline Model 1 contains all control variables including *Prior Horizontal Ties (ij)*. In Model 2 we introduce *Vertical Ties with Issuer (jz)* and in Model 3 we introduce *Underpricing in Vertical Ties with Issuer (jz)* while Model 4 introduces an interaction of *Prior Horizontal Ties (ij)* and *Vertical Ties with Issuer (jz)*. Because relogit doesn't report model fit statistics as it uses the same estimation procedure as the conventional logistic regression and then corrects coefficient estimates and standard errors for the rareness of the events (Jensen, personal communication), we report model fit statistics from the conventional logistic regression to assess the impact of adding new variables into the model.

--- Insert Table 4B about Here---

In Model 4, Hypothesis 1 is supported ($p<0.001$). That is, an increase in the number of prior

relationships between the issuer and a bank increases the probability that this bank is selected as a subordinate member in an issuer's syndicate. Hypothesis 2 is tested by conducting a post-hoc test for the relative size of coefficients of *Prior Horizontal Ties (ij)* and *Vertical Ties with Issuer (jz)*. The latter coefficient has a statistically larger impact on the dependent variable than the impact of the former ($p<0.001$, $\chi^2= 260$). In other words, a single vertical tie between a subordinate syndicate member and an issuer has a more powerful impact on the formation of a future horizontal tie between the lead bank and that subordinate member than a single past horizontal tie between the lead bank and the subordinate syndicate member. Hypothesis 3 is supported as well ($p<0.05$), namely the higher is the underpricing of the offerings that a particular bank has underwritten for the issuer, the less likely is this bank to be included in the future syndicates created on behalf of the same issuer. Finally, Hypothesis 4 is also supported ($p<0.001$), namely the stronger are the prior vertical ties involving the issuer and a bank and the stronger are the prior horizontal ties involving that bank and the bank leading the focal issuer's syndicate, the less likely is that bank to be included as a subordinate member into the focal syndicate.

To have a more nuanced understanding of the differential impact that horizontal and vertical relationships have on the formation of future horizontal ties among banks, we took the coefficients from Model 4 of *Vertical Ties with Issuer (jz)* and *Prior Horizontal Ties (ij)* and depicted how the existence of a vertical or horizontal ties would affect the formation of a subsequent horizontal tie. This figure illustrates the disproportionately large effect of having a vertical relationship on the probability of a future horizontal tie, as compared to the existence of a prior vertical tie. When a bank has neither vertical ties with the issuer nor horizontal ties with a lead underwriter, its baseline probability of getting into a syndicate created on behalf of a specific issuer is 0.008. Having a single vertical tie with the issuer increases this probability to 0.25. At the same time, having a single horizontal tie with the lead underwriter increases this probability to 0.015 only. These results suggest a disproportionately powerful role that vertical relationships have on the formation of the future horizontal ties.

--- Insert Figure 2 about Here---

These results notwithstanding, we were still concerned that the differences in coefficients between *Prior Horizontal Ties (ij)* and *Vertical Ties with Issuer (jz)* were driven by the fact that there were many more opportunities for two banks to collaborate in the PO market over twenty years as compared to the opportunities for collaboration between the issuer and the banks over these twenty years. Because we were

interested in comparing the impact of a single vertical tie to a single horizontal tie on the formation of the future horizontal relationships, z-score standardization of these two variables and their subsequent comparison using the full dataset was not appropriate (Kohler and Kreuter, 2005: 196-197). Instead, we replicated our analyses on a reduced sample that contained dyads driven by a single prior vertical interaction between the issuer and a bank and a single prior horizontal interaction between the two banks. This should allow us to perform a like-to-like comparison of impact of one vertical tie to one horizontal tie on the formation of a future horizontal relationship.

Because our data was left censored, we did not know the history of interactions between firms prior to 1980, but we could split the sample such that the first half (1980-1991) was used to examine whether dyads formed in the later half (1992 to 2001) were really new interactions, and then conduct the analysis on the later half of the sample only. That is, if a tie occurred in 1992 and its parties did not collaborate from 1980 to 1991, we were reasonably sure that 1992 was the first year of the dyad's occurrence. To make sure our analysis reflected dynamics in the first collaborations driven by firms exploiting opportunities in the PO market only, we further reduced our sample by eliminating dyads whose members have had prior interactions in the M&A market. Such sample came to comprise 3,326 realized dyads and 16,630 unrealized dyads (the total of 19,956 dyads) and our analyses are reported in Model 5. As they indicate, *Vertical Ties with Issuer (jz)* still has a larger coefficient than *Prior Horizontal Ties (ij)* ($p<0.001$, $\chi^2=61$). That is, after bank *j* interacted for the first time with issuer *z*, bank *j* had a higher probability of being included as a subordinate member for a subsequent syndicate lead by another bank *i* on behalf of that issuer, as compared to the effect of the first horizontal interaction between bank *j* and bank *i* on this probability. Because this sample was based on single relationships, we also z-score standardized the coefficients of *Prior Horizontal Ties (ij)* and *Vertical Ties with Issuer (jz)* in an additional analysis, however, the difference between their magnitudes was still statistically significant with the latter coefficient still being larger than the former ($p<0.05$, $\chi^2=5.4$)[3].

Would multiplex triads always exhibit conflicting goals and objectives, or would there be some more stable triads operating in a cooperative manner? Coefficient estimates of a control variable *Prior Triads (ijz)*

[3] Note that Model 5 doesn't have an interaction of *Prior Horizontal Ties (ij)* with *Vertical Ties with Issuer (jz)*, because of limited variance in the interaction term (i.e. component variables could only take values of zero or one, according to our sample selection rule). Furthermore, because of limited variance in the *Underpricing in Vertical Ties with Issuer (jz)* it is not significant, although it has a negative sign as expected. However, the objective of this model is not to test Hypothesis 3 and 4, as we intentionally reduced the sample size to perform a sensitivity analysis for Hypothesis 2 only.

in all models, suggest that once the relationships between two specific producers and their common customer have been formed, overcoming conflicts stemming from their divergent interests, these relationships are likely to continue in the future. In other words, while there are hurdles preventing the formation of multiplex triads on the basis of strong relationships, if their members can overcome the conflicting interests and managed to work together, it could yield the emergence of triad-specific collaborative routines will recreate this triad in the future.

DISCUSSION AND CONCLUSION

This study was motivated by the observation that organizations are embedded in multiple interdependent relationships. Consequently, tie formation seemingly driven by prior interactions between two organizations through a particular type of relationship, could in reality be driven by transitive pressures stemming from their embeddedness in a multiplex triad involving different kinds of relationships. Although research has started to recognize the importance of examining interdependences between different relationships (Baker and Faulkner, 2002; Gimeno and Woo, 1996; Gulati and Westphal, 1999), the impact of multiplexity on network dynamics remain poorly understood.

Our study sought to correct this lacuna by explicitly theorizing the interdependences that exist between vertical and horizontal relationships comprising producers and their customer in a multiplex triad. Our analysis of the formation of horizontal syndicate ties shows that these ties are formed not only as a result of the banks' past interactions in horizontal relationships, but also as a result of interactions that they have with their customers in vertical relationships. In fact, we discovered that even though vertical relationships between the customer and two of the producers are unobserved in a horizontal network between producers, these vertical ties are more consequential for the formation of future horizontal dyads than the history of the interactions between these dyad members themselves. Furthermore, we found evidence that horizontal relationships are shaped not only by the agency of producers, as was commonly suggested in the literature (e.g., Porac, Pollock and Wade 2004; Baum, Shipilov and Rowley 2003), but also by the agency of their customers who force producers to form ties to those producers that have protected the interests of the customers in the past. Finally, contrary to the traditional view of transitivity and closure, we find that, in multiplex triads, the increasing strength of underlying dyads decreases the probability of this triad's closure due to the tensions resulting from its members' competing interests, amplified by the strength of the underlying dyads.

Another important insight from this study is the importance of studying the objectives and interests of network players in order to understand the sources of brokerage opportunities. Existing research tends to assume that the absence of a direct connection between two actors prevents them from exchanging information and when the direct tie between them has been established, the ability of the third party to extract brokerage rents between them disappears (Burt, 1992). However, the divergence of interests between two players might prevent them from engaging in full information exchange even in a closed triad, allowing the third party to engage in information brokerage between them. Consequently, what seems like a closed triad, in reality might comprise a social system wherein one player exploits differences in the other players' interests to broker the flows of information. Such "virtual" structural holes would very often be present in closed multiplex triads connecting a customer with two producers vying for the customer's business. This ultimately points to the need of examining not only the structures of relationships but also the properties of nodes (e.g. their roles, interests and objectives) which are being connected by these relationships (Shipilov, 2006), if we were to have a comprehensive understanding of the determinants of brokerage opportunities.

As Borgatti, Mehra, Brass and Labianca (2009: 894) point out, one of the quintessential features of interest about the network theory is that it studies social systems whose properties are different from the properties of their constituent elements. A multiplex triad is an excellent example of this. That is, while the elements of multiplex triads are connected by uniplex relationships, it is only when these elements are brought together, do they create a social system which exhibits multiplexity. Consequently, to the extent that relational multiplexity is a source of opportunities and constraints facing the actor, these could arise not only through the actor's having different relationships of the same kind with a particular partner, but also from the actor being embedded in different kinds of uniplex relationships with different partners.

Enquiry into the multiplex triads also allows us to revisit the baseline assumption of research on the evolution of social structures, which proposes that an organization's position in a network in the past will be replicated in the future (e.g., Gulati 1995; Gulati and Gargiulo 1999; Baum, Rowley, Shipilov and Chuang 2005). That is, given divergent interests of players in multiplex triads, the replication of their past relationships will not be automatic, but rather will be driven by the tensions between collaboration and competition within this triad. These findings are salient in the context of viewing a producer's position in a network as a source of its competitive advantage (Gulati, Noriha, and Zaheer, 2000). While network

positions are indeed difficult to imitate due to the path-dependent process through which they were created – and these positions are undoubtedly valuable due to the access to the resources and capabilities they provide – network positions in multiplex triads could also lock producers in relationships that are designed to create value for the customer. That is, to the extent that a producer's network position is shaped by the agency of its customer, the producer may be forced to collaborate with another producer, even though they have not established collaborative routines nor is such cooperation in the best interests of the focal producer in the first place.

However, why does a producer agree for its network to be shaped by the agency of the customer in a multiplex triad? It seems that an important boundary condition to our theorizing should be the relative power of the customer vis-à-vis the producer. When there is competition for the customer's business, horizontal relationships would be heavily influenced by these preferences of the customer. To list its securities, the issuer's business must represent sufficient interest to a number of banks; ultimately those issuers who end up dong POs have a number of suitors to choose from for leading their syndicates. This gives all issuers bargaining power vis-à-vis investment banks and allows them to influence the construction of their relationships.

While the intensity of competition between producers might make issuers unusually powerful vis-à-vis investment banks in the financial markets, customers influence formation of relationships between producers in the other contexts as well. In the automotive industry, for example, customers, such as Toyota, could design and implement procedures that facilitate formation of close relationships between its suppliers. When a supplier becomes a subcontractor for Toyota, it should be expected to develop collaborative relationships with other subcontractors, even if, initially, these relationships might not exist.

Moreover, just like the customers will force collaboration between affiliated organizations, they are also likely to influence the absence of such relationships, effectively being responsible for the persistent disconnections in the social structure. For instance, General Motors has for a long time avoided relationships with Goldman Sachs, which was the main investment bank for Ford, a key competitor for General Motors (Baker and Faulkner, 2002: 525). Without observing the embeddedness of Goldman Sachs in the vertical relationships with Ford, however, it would have been difficult to understand why this investment bank did not play a role in syndicating the GM's bond or equity offerings. These arguments have very important implications for research on the origins of networks. That is, a disconnection between

two actors in a particular kind of network might exist not because the two parties are not aware of each other, or because they operate in different social circles (Burt, 1992), but because they are connected via buyer-supplier of relationships to third parties which are competitors to each other. While some structural holes might eventually disappear as parties come to understand the benefits of collaboration, disconnections between producers driven by the divergent interests of their customers are likely to persist as a function of power that the customers have over their producers.

Future Research, Limitations and Conclusions

We hope that our findings illustrate that because organizations are simultaneously embedded in different kinds of relationships, it is the interdependence between different kinds of relationships that should be considered the rule rather than the exception, while the existence of independent, self-perpetuating networks based on a single kind of relationships should be considered the exception rather than the rule. To that end, this paper is the first to introduce the concept of multiplex triads to the network literature and we would like to see more research in this area. However, to advance our understanding of triadic multiplexity and relationships' interdependence, one ought to answer a question as to which types of relationships a researcher should examine before he or she can be confident the impact of all possible multiplex triads on the focal dyadic relationship has been accounted for. Baker and Faulkner (2002) suggest that, at the minimum, potential candidates for the multiplex triadic relationships include common customer and suppliers. That is, when one is studying relationships between producers, one needs to account not only for their direct relationships, but also for the relationships between these producers and their customers as well as for the relationships between these producers and their suppliers. Consequently, a useful extension of our study would be to examine not only the relationships connecting investment banks to the issuers, but also the relationships that banks have to different investor groups and how the latter drive formation of horizontal relationships among the banks themselves.

Another promising area of research could be the more explicit examination of competitive strategies pursued by organizations as a result of them forming repeated relationships in the past. For instance, two producers that have extensively collaborated in the past might become increasingly similar in terms of their offerings' repertoire and the kinds of companies that they are capable to serving. As their similarity increases, these producers might be increasingly seen by their customers as substitutable, which could eventually drive fierce competition between these producers for new business and make the

customers more likely to play them off against each other in multiplex triads. Consequently, research ought to examine more closely the interdependences between collaboration, competition and strategy choices (Gimeno and Woo, 1996) within multiplex triads. Yet another interesting direction to follow might be to examine the role that structural position of a firm in the network of vertical and horizontal relationships would have on its ability to force its partners into relationships designed to create more value for the focal firm. For instance, highly central firms or those spanning multiple structural holes in horizontal networks might be better positioned to exert their influence over more peripheral firms, or firms which don't have structural holes in their horizontal networks.

It is important to underscore that our research doesn't invalidate prior findings in studies that model the evolution of horizontal relationships while overlooking the impact of vertical ones (e.g. Li and Rowley, 2002; Baum, Shipilov and Rowley, 2003). Our results indicate that past relationships between banks have an influence on their future ties, although this effect is smaller than the impact of relationships with customers. If anything, our results are complementary to prior research as they suggest a fruitful avenue that could provide additional source of variance in the models of producers' network evolution and change.

Our study has its limitations. First, we did not account for alternative sources of direct experience of dealing with producers, which customers could possess. In the context of POs, such experience could be obtained through the members of the issuing company's supervisory board if its members have been active in listing other companies' shares on the stock markets in the past. By observing pricing decisions of investment banks in the context of other POs, such board members can recommend which bank should be selected as a lead underwriter for the current IPO and which banks should be included as subordinate members of the syndicate. Consequently, even unseasoned issuers with an experienced board may exert influence on the formation of the underwriting syndicates; however, we captured this dynamic neither in our theorizing nor in our analyses.

Second, investment banks themselves could have multiple connections that we did not observe in our data. For instance, investment bankers routinely move from one bank to another during the courses of their careers. If two senior specialists worked with each other in Goldman Sachs, and then both moved on, one going to Merrill Lynch and another ending up with Salomon Smith Barney, would this affect the probability of Merrill Lynch and Salomon Smith Barney forming repeated relationships on subsequent PO

deals, irrespective of the ties which issuers maintain with these individual banks? The impact of such career histories on the future partnering activity of investment banks is captured neither by our data nor by the other network studies that we have reviewed. Clearly, career mobility networks go beyond Baker and Faulkner's list of possible relationships embedding firms in multiplex relationships, but they nonetheless could prove to be useful source of variation for the relationships between producers.

Investment banking industry might be peculiar in how banks are able to occupy different positions as producers, i.e. the same bank might be a subordinate syndicate member in one deal, and then it might seek to become a lead on a subsequent syndicate. Such flexibility in navigating positions creates high levels of competition between syndicate members, which might provide a partial explanation for the tensions we have identified within their multiplex triads. In the industries where organizations have more rigid positions (i.e. a car assembler, Tier 1, 2 or 3 supplier in the automotive industry), the conflicting interests between them might be less pronounced, hence the competition within multiplex triads might be less intense. That said, as the Magna International's 2009 bid for Opel demonstrates, even in such industries organizations might still seek to transcend their positions by engaging in vertical integration, i.e. a tier 2 supplier might buy a tier 1 supplier and then even seek to become a final car assembler, so the tensions in their multiplex triads might still be quite powerful. More generally, it would be interesting to examine variations in the positional flexibility of organizations in the other industries and to what extent this flexibility accounts for the tensions within resulting multiplex triads.

Despite these caveats, our study joins a small but growing body of research on network multiplexity. The main conclusion of this study is that even though vertical customer-producer relationships are not accounted for in the models of horizontal network evolution, customers and their agency *do* play an important role in the formation of horizontal networks via their embeddedness in multiplex triads. Such triads contain players with divergent interests, ultimately making transitivity not an automatic occurrence, but rather a product of complex compromises and negotiations which are often resolved not in the best interests of all the parties involved. In highlighting these points, we hope to have achieved a more nuanced understanding of transitivity and closure as well as moved the frontier of research toward a richer understanding of where network positions of organizations came from.

REFERENCES

Ahuja, G. 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. Admin. Sci. Quart. 45(3): 425-455.

Arikan, A & L. Capron. Do Newly-Public Acquirers Benefit or Suffer From Their Pre-IPO Affiliations. Strategic Management J., Forthcoming.

Arthurs, J., Hoskisson, R., Busenitz, L., & Johnson, A. 2008. Managerial agents watching other agents: Multiple agency conflicts regarding underpricing in IPO firms. Acad. of Management J., 51(2): 277-294.

Baker, W.E. 1984. The social structure of a national securities market. Amer. J. of Sociology, 89: 775-811.

Baker, W.E. 1990. Market networks and corporate behavior. Amer. J. of Sociology, 96: 589-625.

Baker, W.E. & Faulkner, R. 2002. Interorganizational Networks. In J.A.C. Baum (Ed.), Companion to Organizations: 521-540. Oxford, UK: Blackwell.

Baker, W. & Obstfeld, D. 1999. Social capital by design: Structures, strategies and institutional context. In R. T. A. J. Leenders & S. Gabbay (Eds.), Corporate social capital and liability: 88-105. Norwell, MA: Kluwer Academic.

Baum, J., Calabrese, T., & Silverman, B. 2000. Don't go it alone: Alliance network composition and startups performance in Canadian biotechnology. Strategic Management J., 21(Special Issue): 267-294.

Baum, J.A.C., Shipilov, A.V., & Rowley, T. 2003. Where do Small Worlds Come From? Industrial and Corporate Change, 12(3): 697-725.

Baum, J.A.C., Rowley, T., Shipilov, A.V., & Chuang, Y.-T. 2005. Dancing with Strangers: Aspiration Performance and the Search for Underwriting Syndicate Partners. Admin. Sci. Quart., 50(4): 536-575.

Baum, J., McEvily, B., & Rowley, T. this issue. Better with age? Tie longevity and the performance implications of bridging ties and closure. Organ. Sci.

Beckman, C., Haunschild, P., & Phillips, D. 2004. Friends or strangers? Firm-specific uncertainty, market uncertainty and network partner selection. Organ. Sci., 15(3): 259-275.

Benveniste, L.M. & Spindt, P.A. 1989. How investment bankers determine the offer price and allocation of new issues. J. of Financial Economics, 24: 343-361.

Borgatti, S., Mehra, A., Brass, D. & Labianca G. 2009. Network Analysis in the Social Sciences. Sci. 323: 892-895

Burt, R. 1992. Structural Holes: The Social Structure of Competition. Cambridge, MA: Harvard University Press.

Chung, S.A., Singh, H., & Lee, K. 2000. Complimentarity, status similarity and social capital as drivers of alliance formation. Strategic Management J., 21(1): 1-22.

Corwin, S. & Schultz, P. 2005. The Role of IPO Underwriting Syndicates: Pricing, Information Production, and Underwriter Competition. The J. of Finance, LX(1): 443-486.

Davis, J. A. 1979. The Davis/Holland/Leinhardt studies: An overview. In P. W. Holland & S. Leinhardt (Eds.), Perspectives on Social Network Research: 51-62. New York: Academic Press.

Draho, J. 2004. The IPO decision: Why and how companies go public. Cheltenham, UK: Edward Elgar.

Dunbar, C. 2000. Factors affecting investment bank initial public offering market share. J. of Financial Economics, 55: 3-41.

Dyer, J. & Nobeoka, K. 2000. Creating and managing a high performance knowledge sharing network: The case of Toyota. Strategic Management J., 21: 345-367.

Dyer, J.H. & Hatch, N. 2006. Relation-Specific Capabilities and Barriers to Knowledge Transfers: Creating Advantage through Network Relationships. Strategic Management J., 27: 701-719.

Ellis, K., Michaely, R., & O'Hara, M. 2000. When the underwriter is the market maker: An examination of trading in the IPO aftermarket. J. of Finance, 55: 1039-1074.

Gargiulo, M. 1993. Two-step leverage: Managing constraint in organizational politics. Admin. Sci. Quart., 38: 1-19.

Gimeno, J. 2004. Competition within and between networks: The contingent effect of competitive embeddedness on alliance formation. Acad. of Management J., 47(6).

Gimeno, J. & Woo, C. 1996. Economic multiplexity: The structural embeddedness of cooperation in multiple relations of interdependence. Adv. in Strategic Management, 13: 323-361.

Granovetter, M. S. 1973. The Strength of Weak Ties. Amer. J. of Sociology, 78: 1360-1380.

Groysberg, B. & Lee, L. forthcoming. Hiring Stars and Their Colleagues: Exploration and Exploitation in Professional Service Firms. Organ. Sci.

Gulati, R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. Acad. of Management J., 38(1): 85-112.

Gulati, R. & Gargiulo, M. 1999. Where do inter-organizational networks come from? Amer. J. of Sociology, 104(5): 1439-1493.

Gulati, R. & Westphal, J. 1999. Cooperative or Controlling? The Effects of CEO-board Relations and the Contents of Interlocks on the Formation of Joint Ventures. Admin. Sci. Quart., 44: 473-506.

Gulati, R., Noriha, N., & Zaheer, A. 2000. Strategic networks. Strategic Management J., 21(Spring Special Issue): 203-215.

Gulati, R., Dialdin, D., & Wang, L. 2002. Organizational Networks. In J.A.C. Baum (Ed.), Companion to Organizations: 281-304. Oxford: UK: Blackwell.

Gulati, R., Sytch, M., & Tatarinovycz, A. this issue. The dynamics of social structure: The emergence and decline of small worlds. Organ. Sci.

Hagedoorn, J. 2006. Understanding the cross-level embeddedness of interfirm partnership formation. Acad. of Management Rev., 31(3): 670-680.

Halpern, J. 1996. The effect of friendship on decisions: Field studies of real estate transactions. Human Relations, 49: 1519-1547.

Hanley, K.W. 1993. The underpricing of initial public offerings and the partial adjustment phenomenon. J. of Financial Economics, 34(2): 231-250.

Hansen, M.T. 1999. The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. Admin. Sci. Quart, 44: 82-111

Heider, F. 1964. The Psychology of Interpersonal Relations. London: John Wiley & Sons.

Helper, S. & Levine, D. 1992. Long-term supplier relations and product-market structure. J. of Law, Econom. and Organ., 8: 561.

Helper, S., J.P.MacDuffie & Sabel, C. 2000. Pragmatic collaborations: Advancing knowledge while controlling opportunism. Industrial and Corporate Change, 9 (3): 443-488.

Hoetker, G., Swaminathan, A., & Mitchell, W. 2007. Modularity and the impact of buyer-supplier relationships on the survival of suppliers. Management Sci., 53: 171-191.

Ibarra, H. 1995. Race, opportunity, and diversity of social circles in managerial networks. Acad. of Management J., 38: 673-703.

Ingram, P. & Roberts, P. 2000. Friendships among competitors in the Sydney hotel industry. Amer. J. of Sociology, 106(2): 387–423.

Jensen, M. 2003. The role of network resources in market entry: Commercial banks' entry into investment banking, 1991-1997. Admin. Sci. Quart., 48(3): 466-497.

King, G. & Zeng, L. 2001. Logistic regression in rare events data. Political Analysis, 9: 1-27.

Kohler, U. & Kreuter, F. 2005. Data analysis using STATA: Stata Press.

Krackhardt, D. 1998. Simmelian ties: Super strong and sticky. In R. Kramer & M. Neale (Eds.), Power and Influence in Organizations: 21-38. Thousand Oaks, CA: Sage.

Krackhardt, D. & Kilduff, M. 1999. Whether close or far: social distance effects on perceived balance in friendship networks. J. of Personality and Social Psych., 76(5): 770-782.

Li, S.X. & Rowley, T.J. 2002. Inertia and evaluation mechanisms in interorganizational partner selection: Syndicate formation among U.S. investment banks. Acad. of Management J., 45(6): 1104-1120.

Ljungqvist, A. & Wilhelm, W.J. 2003. IPO Pricing in the Dot-com Bubble. J. of Finance, 58(2): 723-752.

Ljungqvist, A. 2007. IPO Underpricing. In B.E. Eckbo (Ed.), Handbook of Corporate Finance: North-Holland.

Madhavan, R., Gnyawali, D., & He, J. 2004. Two's company, three's a crowd? Triads in cooperative-competitive networks. Acad. of Management J., 47(6): 918-927.

Newman, M. 2001. The structure of scientific collaboration networks. Proc. of the National Acad. of Sci., 98(2): 404-409.

NewsWire. 2003. CSFB Is Ordered to Hand Over Documents Wall Street Journal (October 3), 3 October ed.

Pichler, P. & Wilhelm, W. 2001. A theory of the syndicate: Form follows function. J. of Finance, 56: 2237-2264.

Podolny, J. 1993. A status-based model of market competition. Amer. J. of Sociology, 98: 829-872.

Podolny, J. 1994. Market uncertainty and the social character of economic exchange. Admin. Sci. Quart., 39(3): 458-470.

Pollock, T., Porac, J., & Wade, J. 2004. Constructing deal networks: Brokers as network "architects" in the U.S. IPO market and other examples. Acad. of Management Rev., 29: 50-72.

Reuter, J. 2006. Are IPO Allocations for Sale? Evidence from the Mutual Fund Industry. Journal of Finance, 61(5): 2289-2324.

Rogers, W.H. 1993. Regression standard errors in clustered samples. Stata Tech. Bull., 13: 19-23.

Rowley, T., Behrens, D., & Krackhardt, D. 2000. Redundant governance structures: An analysis of structural and relational embeddedness in the steel and semiconductor industry. Strategic Management J., 21: 369-386.

Schreiner, M., Kale, P., & Corsten, D. 2009. What really is alliance management capability and how does it impact alliance outcomes and success? Strategic Management J., 30(13): 1395-1419.

Shipilov, A.V. 2006. Network strategies and performance of Canadian investment banks. Acad. of Management J., 49(3): 590-604.

Shipilov, A.V., Rowley, T.J., & Aharonson, B. 2006. When do networks matter? A study of tie formation and decay. In J.A.C. Baum & S.D. Dobrev & A. van Witteloostuijn (Eds.), Advances in Strategic Management: Elsevier.

Siconolfi, M. 1996. More Firms Switch Underwriters – Change Often Comes Following an IPO; Client Loyalty Fades The Wall Street Journal (December 19).

Smelser, N. & Swedberg, R. 1994. The sociological perspective on the economy. In N. Smelser & R. Swedberg (Eds.), The Handbook of Economic Sociology: Princeton Press.

Swedberg, R. 1994. Markets as Social Structures. In N. Smelser & R. Swedberg (Eds.), The Handbook of Economic Sociology: 255-282. Princeton: Princeton Press.

Tomz, M.; Relogit: Rare events logistic regression.

Uzzi, B. 1996. The sources and consequences of embeddedness for the economic performance of organizations: The network effect. Amer. Sociological Rev., 61: 674-698.

Vissa, B. this issue. Agency in Action: Entrepreneurs' Networking Style and Initiation of Economic Exchange. Organ. Sci.

Washington, M. & Zajac, E. 2005. Status evolution and competition: Theory and evidence. Acad. of Management J., 48(2): 282-296.

White, H. 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica, 48: 817-838.

TABLE 1: AREAS OF COLLABORATION AND COMPETITION AMONG PO MARKET PARTICIPANTS [a]

	Issuer	**Lead bank**	**Syndicate members**	**Investors**
Issuer	n/a	Issuer prefers low underpricing to make the most money, lead bank prefers high underpricing to please its investors/ get favours from them	Issuer requests the syndicate to work collaboratively, while syndicate members seek to undermine lead bank's ability to secure future mandates from the issuer	Investors prefer high underpricing, Issuer prefers low underpricing
Lead bank	Issue completion Market creation for the issue Long-term price increase of offered securities	n/a	Lead banks demand the syndicate members to support trading of the new securities Syndicate members might stop supporting the trading if market conditions deteriorate Syndicate members in their quest for future lead mandates from the issuer might criticize pricing decisions of the lead bank, and might provide issuer with ammunition in pricing negotiations with the lead Failures in syndicates are attributed to the lead bank's mismanagement, while non-cooperative actions of syndicate members draw less attention	No areas of competition between investors and lead bank
Syndicate members	Issue completion Market creation for the issue Long-term price increase of offered securities Comprehensive analyst coverage	Issue completion Market creation for the issue Long-term price increase of offered securities Comprehensive analyst coverage Increases in market share Enhancing professional reputation Record of raising capital for the customers Compensation (commissions)	n/a	Syndicate members seek to reduce underpricing to win future business from the issuer, which means smaller short-term gains for investors Syndicate members might stop supporting the trading if market conditions deteriorate, which could lead to a drop in short-term price of the issue
Investors	Issue completion Market creation for the issue Long-term price increase of offered securities Continued analyst coverage	Issue completion Market creation for the issue Long term price increase of offered securities Comprehensive analyst coverage High initial issue underpricing	Issue completion Market creation for the issue Comprehensive analyst coverage Long term price increase of offered securities	n/a

[a] Cells below the diagonal represent areas of collaboration between a particular pair of actors, while cells above the diagonal represent their areas of competition.

TABLE 2: CONTROL VARIABLES

Stage 1	
Number of Prior Bank-Issuer Ties (iz) (log)	Number of times bank i underwrote POs for issuer z
Underpricing in Vertical Ties (iz)	Computed similar to Underpricing in Vertical Ties (jz)
Number of Prior MA Ties (iz) (log)	Number of times that bank i advised client z on M&A transactions, where z was the parent company of either the target or the acquirer
Same Industry Experience (i)	Number of times that bank i participated in underwriting POs in the same 2-digit SIC code as the SIC code of the focal offering
Bank's Status (i)	Normalized Bonacich centrality of bank i in the PO network
Bank-Issuer Dependence (iz)	Revenues that bank i has generated from its dealings with issuer z both in the PO market and in the M&A market over the total revenue which bank i has collected in both markets
Stage 2	
Prior MA Ties (ij) (log)	Number of times two banks i and j together provided M&A advisory services to either targets or to the acquirers
Prior MA Ties (jz) (log)	Number of times a potential syndicate member j provided M&A advice to client z
Average PO Offering Value (iz)	Average dollar value of prior PO deals, in which bank i lead for client z in billion dollars
Average PO Offering Value (jz)	Average dollar value of prior PO deals, which bank j lead for issuer z in billion dollars
Average M&A Value (iz)	Average dollar value of prior M&A deals on which bank i has advised client z in billion dollars
Average M&A Value (jz)	Average dollar value of prior M&A deals in which bank j has advised client z in billion dollars
Total Revenue (i)	Amount of PO underwriting fees and M&A advisory fees that bank i collected from the PO and M&A market respectively in billion dollars
Total Revenue (j)	Amount of PO underwriting fees and M&A advisory fees that bank j collected from the PO and M&A market respectively in billion dollars
Underpricing in Prior Horizontal Ties (ij)	Average of underpricing which banks i and j have achieved across all the issues in which they have worked together
Status Similarity (ij)	Status Similarity(ij) = 1-{|Status(i) – Status(j)|/(Status(i)+Status(j))}, where statuses were computed as banks' Bonacich centralities in the PO network
Same Industry Experience (j)	Number of times that bank j participated in underwriting POs in the same 2-digit SIC code as the SIC code of the focal PO
Prior Multiplex Triads (ijz) (log)	Number of times bank i lead an offering for an issuer z on which j was a subordinate syndicate member
Industry PO Volume	Dollar volume of PO deals in the entire industry (in trillion of dollars)
Industry M&A Volume	Dollar volume of M&A deals in the entire industry (in trillion dollars)

TABLE 3A: DESCRIPTIVE STATISTICS AND CORRELATIONS (VERTICAL TIES)

	Variable	Mean	s.d.	Min	Max	1	2	3	4	5	6
1	Issuer-Lead Tie (iz)	0.167	0.373	0.000	1.000						
2	Number of Prior Bank-Issuer Ties (iz)[a]	0.044	0.210	0.000	2.996	0.425					
3	Underpricing in Prior Bank-Issuer Ties (iz)	0.001	0.029	-0.494	2.767	0.071	0.169				
4	Number of Prior M&A Ties (iz)	0.001	0.035	0.000	2.708	0.073	0.058	0.001			
5	Bank's Same Industry Experience (i)	8.322	25.101	0.000	356	0.427	0.323	0.117	0.021		
6	Bank's Status (i)	18.288	41.778	0.000	248	0.600	0.398	0.094	0.057	0.605	
7	Bank-Issuer Dependence (iz)	0.001	0.020	0.000	1.000	0.021	0.091	0.009	0.016	-0.002	-0.010

1. N = 161,418 observations; 2. Notation: z-issuer, i-lead bank; 3. Issuer-Lead Tie (iz) is computed in period t+1, all other variables are in period t

TABLE 3B: DESCRIPTIVE STATISTICS AND CORRELATIONS (HORIZONTAL TIES)

	Variable	Mean	s.d	Min	Max	1	2	3	4	5	6	7	8	9	10	11
1	PO Tie (ijz)	0.167	0.373	0.000	1.000											
2	Prior MA Ties (ij)	0.133	0.469	0.000	3.912	0.340										
3	Prior MA Ties (jz)	0.001	0.029	0.000	2.079	0.060	0.072									
4	Average PO Offering Value (iz)	0.050	0.313	0.000	7.146	0.000	0.025	-0.003								
5	Average PO Offering Value (jz)	0.001	0.056	0.000	7.146	0.038	0.053	0.007	0.039							
6	Average M&A Value (iz)	0.060	0.461	0.000	15.415	0.000	0.045	0.016	0.054	0.010						
7	Average M&A Value (jz)	0.006	0.377	0.000	67.565	0.028	0.042	0.019	0.016	0.014	0.035					
8	Total Revenue (i)	1.973	2.585	0.000	13.303	0.000	0.182	0.001	0.211	0.008	0.144	0.021				
9	Total Revenue (j)	0.242	0.892	0.000	13.320	0.319	0.587	0.038	0.020	0.103	0.027	0.072	0.081			
10	Underpricing in Prior Horizontal Ties (ij)	0.004	0.084	-0.990	4.000	0.046	0.007	-0.004	0.010	0.003	0.009	-0.001	0.064	0.019		
11	Status Similarity (ij)	0.190	0.275	0.000	1.000	0.375	0.375	0.044	-0.029	0.028	-0.012	0.018	-0.150	0.314	0.012	
12	Same Industry Experience (j)	6.376	19.698	0.000	357.000	0.355	0.268	0.013	0.016	0.064	0.013	0.043	0.087	0.385	0.073	-0.301
13	Prior Multiplex Triads (ijz)	0.029	0.153	0.000	2.197	0.382	0.191	0.011	0.049	0.017	0.000	0.010	0.021	0.158	0.057	-0.227
14	Industry PO Volume	0.356	0.176	0.051	0.660	0.000	0.014	-0.018	0.083	0.010	0.072	0.012	0.426	0.119	0.021	0.072
15	Industry M&A Volume	2.062	1.290	0.247	4.326	0.000	0.014	-0.012	0.086	0.011	0.077	0.015	0.434	0.123	0.019	0.038
17	Prior Horizontal Ties (ij)	0.511	0.991	0.000	5.063	0.531	0.627	0.052	0.028	0.050	0.035	0.035	0.178	0.554	0.082	-0.549
18	Vertical Ties with Issuer (jz)	0.009	0.088	0.000	2.708	0.212	0.114	0.065	-0.004	0.191	-0.005	0.007	-0.016	0.120	0.010	-0.123
19	Underpricing in Vertical Ties with Issuer (jz)	0.000	0.022	-0.632	3.960	-0.003	-0.004	-0.009	0.001	0.027	0.002	0.002	0.000	0.001	0.006	0.002

	Variable	12	13	14	15	16	17
13	Prior Multiplex Triads (ijz)	0.278					
14	Industry PO Volume	0.155	-0.028				
15	Industry M&A Volume	0.144	-0.037	0.930			
16	Prior Horizontal Ties (ij)	0.490	0.366	0.040	0.025		
17	Vertical Ties with Issuer (jz)	0.134	0.075	-0.036	-0.033	0.155	
18	Underpricing in Vertical Ties with Issuer (jz)	0.032	0.020	-0.011	-0.009	0.010	0.025

1. N = 87,048 observations; 2. Notation: z- issuer, i – lead bank, j – subordinate bank; 3. *PO Tie (iz)* is computed in period t+1, all other variables are in period t.

TABLE 4A: FORMATION OF VERTICAL TIES

Variables	**Model 1**
Number of Prior Bank-Issuer Ties (iz)	4.098** (0.116)
Underpricing in Prior Bank-Issuer Ties (iz)	-1.514** (0.557)
Number of Prior M&A Ties (iz)	4.531** (0.523)
Bank's Same Industry Experience (i)	0.012** (0.001)
Bank's Status (i)	0.032** (0.001)
Bank-Issuer Dependence (iz)	-0.519 (0.761)
Constant	-5.752** (0.017)

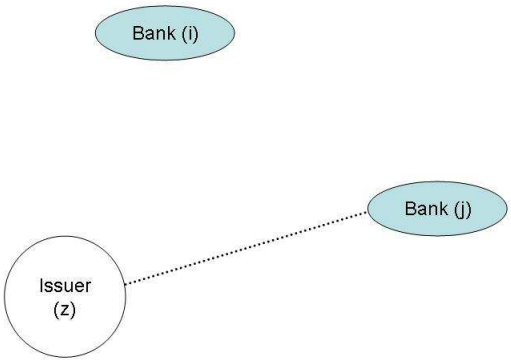
1. N = 161,418 observations; 2. Robust standard errors in parentheses; 3. + significant at 10%; * significant at 5%; ** significant at 1%; 4. Notation: z-issuer, i-lead bank.

TABLE 4B: FORMATION OF HORIZONTAL TIES

	Model 1	Model 2	Model 3	Model 4	Model 5
Prior MA Ties (ij)	0.132**	0.124**	0.123*	0.127**	
	(0.049)	(0.048)	(0.048)	(0.048)	
Prior MA Ties (jz)	3.342**	3.132**	3.130**	3.137**	
	(0.750)	(0.811)	(0.810)	(0.809)	
Average PO Offering Value (iz)	-0.045	-0.035	-0.035	-0.030	0.282
	(0.088)	(0.078)	(0.078)	(0.076)	(0.178)
Average PO Offering Value (jz)	0.263	-0.673**	-0.660**	-0.487**	-185.09**
	(0.725)	(0.230)	(0.228)	(0.109)	(13.800)
Average M&A Value (iz)	-0.046	-0.037	-0.037	-0.038	
	(0.027)	(0.024)	(0.024)	(0.024)	
Average M&A Value (jz)	0.063	0.062	0.062	0.062	
	(0.048)	(0.046)	(0.046)	(0.047)	
Total Revenue (i)	-0.034*	-0.031*	-0.031*	-0.032*	0.028
	(0.014)	(0.013)	(0.013)	(0.013)	(0.04)
Total Revenue (j)	-0.034	-0.042	-0.042	-0.043	0.378**
	(0.028)	(0.028)	(0.028)	(0.027)	(0.121)
Underpricing in Prior Horizontal Ties (ij)	0.178	0.193	0.190	0.193	0.042
	(0.182)	(0.191)	(0.190)	(0.189)	(0.253)
Status Similarity (ij)	0.499**	0.462**	0.461**	0.461**	0.851**
	(0.159)	(0.162)	(0.162)	(0.162)	(0.298)
Same Industry Experience (j)	0.016**	0.015**	0.015**	0.015**	0.063**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.008)
Prior Multiplex Triads (ijz)	4.685**	4.720**	4.720**	4.716**	6.04**
	(0.213)	(0.217)	(0.217)	(0.217)	(0.722)
Industry PO Volume	-0.036	0.061	0.060	0.067	6.15**
	(0.235)	(0.237)	(0.239)	(0.237)	(0.570)
Industry M&A Volume	0.007	0.013	0.013	0.013	
	(0.037)	(0.037)	(0.037)	(0.037)	
Probability of a Bank Selection as a Lead (iz)	0.237**	0.236**	0.236**	0.235**	0.231**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.052)
Prior Horizontal Ties (ij)	1.003**	1.000**	1.000**	1.007**	1.992**
	(0.048)	(0.048)	(0.048)	(0.049)	(0.123)
Vertical Ties with Issuer (jz)		4.397**	4.386**	5.371**	10.50**
		(0.208)	(0.209)	(0.345)	(1.062)
Underpricing in Vertical Ties with Issuer (jz)			-1.116*	-0.924*	-1.722
			(0.505)	(0.454)	(3.333)
Prior Horizontal Ties (ij) x Vertical Ties with Issuer (jz)				-0.962**	
				(0.146)	
Constant	-5.876**	-5.995**	-5.997**	-6.002**	-7.730**
	(0.139)	(0.143)	(0.143)	(0.144)	(0.332)
Log Likelihood/sig. of change from prev. model	-26,106/ n.a	-25,525/**	-25,521/**	-25,494/**	-6,270/ n.a.

1. N = 87,048 observations in Models 1-4; 2. N= 19,956 observations in Model 5; 3. * significant at 5%; ** significant at 1%. 4. Notation: z- issuer, i – lead bank, j – subordinate bank; 5. Models include industry fixed effects.

FIGURE 1:
FORMATION OF MULTIPLEX TRIADS ON THE BASIS OF VERTICAL AND HORIZONTAL TIES



Time T 1

Time T 2

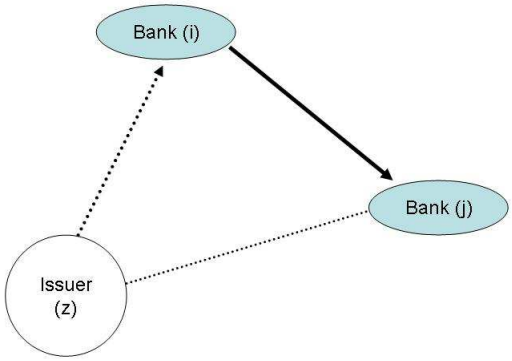
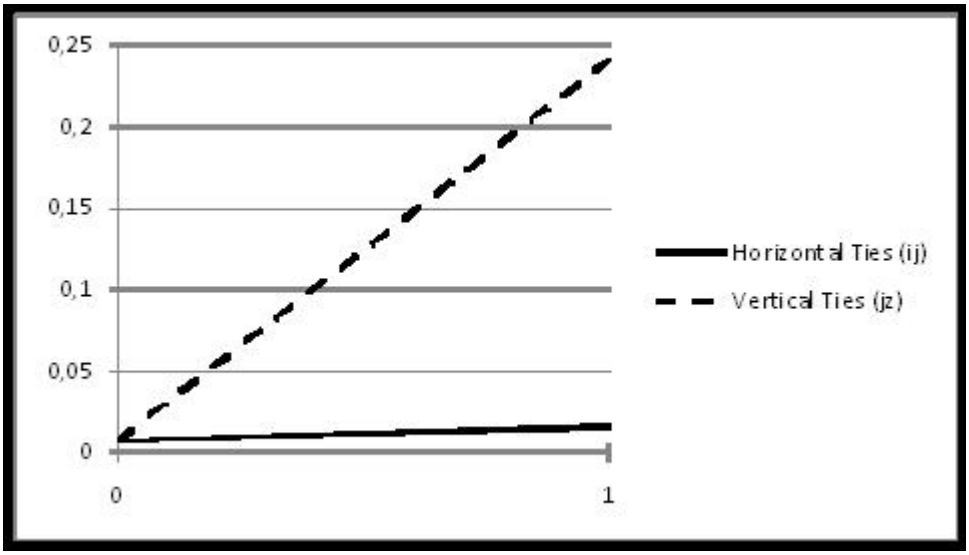


FIGURE 2:
DIFFERENTIAL IMPACT OF A PAST VERTICAL OR OF A PAST HORIZONTAL TIE ON THE PROBABILITY OF FORMING A FUTURE HORIZONTAL TIE



Europe Campus
Boulevard de Constance
77305 Fontainebleau Cedex, France
Tel: +33 (0)1 60 72 40 00
Fax: +33 (0)1 60 74 55 00/01

Asia Campus
1 Ayer Rajah Avenue, Singapore 138676
Tel: +65 67 99 53 88
Fax: +65 67 99 53 99

www.insead.edu

Printed by INSEAD

INSEAD

The Business School
for the World®