Conflict and Collaboration in Business Organization: A Preliminary Study

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Introduction

Macaulay's (1963) “Non-contractual relations in business: a preliminary study” was ahead of its time. The article was published in a prominent place. The *American Sociological Review* (ASR) is one of the sociology's two flagship journals. Still, its citations (in the ISI index) were but drips until the middle of the 1970s, and had grown only to a trickle as of the middle of the 1980s. Then, however, something happened. There was an explosion of interest in the article across the social sciences -- sociology, business, economics, law and beyond. That trickle soon grew into a stream, and come the 1990s there was a river. Macaulay's article is today among the twenty most cited articles in the history of the ASR. It was recognized by the journal's editor in 2005 as one of its “greatest hits” (Jacobs 2005). And it was in 2010 cited more times than it had been in any year previous. This did not happen, notably, because the article somehow improved with age. While contemporary and prescient in its considerations, it is not obviously better now than it was in 1963. Rather, at least as things look from our vantage point in sociology, what changed first was the world; scholarship followed (and perhaps contributed).

The 1970s saw a weakening of the hold of the M-form corporation -- which had played so centrally in Oliver Williamson's theories -- on the minds of managers the world over. It gave way in the face of market and technological uncertainties that led the vertically integrated corporate behemoths that had dominated the post-war period to turn outward and to rely increasingly on a raft of suppliers and other organizations for help designing, making, and selling their products. These changes naturally made relationships between organizations -- where contract rather than employment law reigns -- far more important than they been in years previous. The 1980s hence unsurprisingly gave rise to spirited debates over how best to understand this new “post-fordist” world. Michael Piore and Charles Sabel published *The Second Industrial Divide*, which took to task Alfred Chandler for supposing that technology might be destiny. Mark Granovetter published an article on the “embeddedness of economic action” taking to task Williamson for his “undersocialized” actors. And, in sociology, a new subdiscipline -- the “new economic sociology” -- was organized around the finding that actors' "embedding" in wider webs of social relations affects whether and how they transact far better than can an analysis that looks just at characteristics of the transactions themselves.

The new economic sociology took another turn with an article by Walter W. Powell who, in another article that has significantly marked the sociological debate, again took Williamson to task. Powell chastised Williamson not just for his undersocialized actors, but also for his insistence on treating all transactions as governed either in markets, by hierarchies, or by a hybrid of those two classic forms. Echoing MaCaulay (and citing MacNeil) -- who had based his 1963 article on a field study of contracting between organizations -- Powell [1990: 298] attacked

the view that "network" modes of transactional governance might usefully be seen as a "mixed mode or intermediate notion." That view, he wrote, "is not particularly helpful. It is historically inaccurate, overly static, and it detracts from our ability to explain many forms of collaboration that are viable means of exchange." And, he therefore argued, it was better to think of about "networks as a distinctive form of coordinating economic activity" [Powell 1990: 301], a form with its own distinctive logic that is "more social -- that is, more dependent on relationships, mutual interests and reputation -- as well as less guided by a formal structure of authority" than are the logics that govern market and hierarchy.

Nothing gives prominence to an article like a good fight that -- even if not always directly -- circles around one of its central claims. If things go well, those fights generate new knowledge by pushing those claims, by testing them across new areas of inquiry, by combining with other ideas to develop new theory, and so on. In sociology (and not only) things have gone well. Williamson and the transactions-cost economists have responded. They accepted that Williamson had been wrong in his presumption that the distribution of governance forms "was thick in the tails" and have conceded that hybrid forms are quite common, but have retained their attachment to a conception of the actor that, in the eyes of most sociologists, is "undersocialized." Yet while there is certainly respect for Williamson's contributions, including especially his success in turning the eyes of social science towards institutions and questions of governance, there is a relative consensus in sociology that Granovetter and Powell were essentially right. An enormous number of studies have sought to show that exchange and contract are embedded in social relations and that this matters for a variety of outcomes. They have also documented the diffusion and workings of forms of transactional governance characterized by a distinctive "network" logic of exchange that renders them irreducible either to market or to hierarchy, or to some "mongrel hybrid."

These are advances. The sociological debate, however, has somehow in the intervening years also managed to forget some of the lawyerly considerations that sat naturally in MaCaulay's original article. In particular, the sociological literature has neglected to recognize the degree to which collaboration and conflict are so often *simultaneously* present in the same relationships.[1] This is likely due to the way in which that literature has grown in the wake of Granovetter and Powell's writings. It has been fundamentally marked by its dialogue with the work of Williamson, TCE, and the presumption that collaboration among self-interested actors will in most cases be relatively fragile. Sociological studies have thus sought primarily show that collaborative inter-organizational relations are not just feasible but prevalent when transactions are frequent, assets are specific, and outcomes uncertain (that is, under exactly the condition that TCE expects to generate hierarchy). And they have in the process identified a broad range of institutional, social, and cultural mechanisms to explain variation in the diffusion and character of network forms of transactional governance.[2] Indeed, the field of inter-organizational relations has gotten

[1] One of the most evocative quotes in the article, for example, comes from a businessman who says, "You can settle any dispute if you keep the lawyers out of it. They just do not understand the give-and-take needed in business." The quote makes clear both that there is collaboration, but that the party is aware that litigation is potentially in the background -- and, in another insight from that article -- might be forced on otherwise collaborative parties from elsewhere in their organizations.

[2] See e.g.. Josh D. Whitford (2005); James R. Lincoln and Michael L. Gerlach (2004); Hitt et al (2004).

established enough that it even has its own handbook from Oxford University Press -- published in 2008.

Yet while the existence of that handbook evidences the institutionalization of the inter-organizational networks as a legitimate conceptual entity worthy of sustained investigation, its content quite plainly evinces a gap. The field, as the editors note, includes the analysis of both collaborative *and* conflictual relations; the studies in the handbook -- like most studies in the field -- concentrate their attentions on just the former sort. This is not to say that sociological studies are *unaware* of conflict, or that they pay no attention to formal contract with its at least implicit (and often explicit) recognition that conflict and competition are the backdrop against which collaboration occurs. There are many studies of patterns of formal (contractual) alliances and joint ventures. Especially notable studies include work by Gulati [1995] and by Gulati and Gargiulo [1999] showing that firms sharing a common partner are likely to form collaborative relations among themselves. There is also a study by Stuart [1998, p. 672] showing that semiconductor firms with a high degree of technological overlap are more likely to form alliances, both in order to avoid duplicate investment and because "organizations are better able to evaluate and internalize the know-how of technologically similar firms."[3] But those studies and others like them have not investigated the ways in which collaboration and conflict may be present across the very same relationships, or perhaps simultaneously present in the same social milieu. Rather, extant empirical studies on inter-firm relations tend to focus on a single dimension of relation -- typically collaboration or its absence -- when in fact inter-firm relations tend in reality to be multiplex and dynamic, and to simultaneously intermingle collaboration, conflict, trust and distrust (Dirks et al. 2009).[4]

The focus on collaboration to the relative exclusion of conflict is especially notable in light of the fact that business litigation -- as a percentage of court cases -- increased in the 1970s and early 1980s (Kenworthy et al 1996, Dunworth & Rogers 1996, Cheit & Gersen 2000). This increase, however, does not necessarily show an increase in the tendency to litigate, *ceteris paribus*. It notably occurred simultaneous to the blurring of organizational boundaries, and may in fact reflect be a function of a consequent increase in the sorts of disputes "ripe" for litigation.[5] Still, it makes the decision to downplay conflict puzzling, and raises a series of questions. What are the

[3] Trapido [2007] uses the idea of "competitive embeddedness" theorizing that competing firms are likely to collaborate due to the mechanisms of "familiarity and knowledge-based trust, both are greater between competitors." Trapido finds supportive evidence in investment syndicates in the venture capital industry.

[4] A prominent example, for instance, is illustrated in the recent relation between Apple and Google -- where a once-close relation rapidly devolved into an ugly fight. See "Apple's Spat with Google Is Getting Personal," http://www.nytimes.com/2010/03/14/technology/14brawl.html?pagewanted=all. The interesting part of the Apple-Google relation is that the close collaboration began in 2006, but as Google entered into the mobile market, their relation becomes sour. In March 2010, Apple sued Google's smartphone alliance partner (HTC, a Taiwanese company). Although Apple did not directly sue Google, the IT community interpreted the case as the true fight was between Apple and Google.

[5] Most scholarship on litigation focuses on the general economic or institutional environment that a firm faces. Legal scholars have suggested that the likelihood of business litigation is a function of the degree of competition and performance pressure in the industry, the direct and non-direct costs of litigation (e.g. the substitution cost of an existing supplier), the availability of alternative dispute resolution mechanisms (e.g. arbitration), and the organization of legal services providers (Galanter et al. 1991, Kenworthy et al 1996, Gersen 1999, Cheit & Gersen 2000, Suchman & Cahill 1996).

relationships and dynamics between collaborative relations and conflictual relations? Do preexisting alliances avoid a subsequent battle? Does a prior fight prevent a subsequent formation of alliance? How does a firm's relation with another firm affect the firm's relation with a third-party when the relation is multiplex? To answer these questions, we investigate contractual alliances and lawsuits -- the very formal form of collaboration and conflict, among globally important semiconductor companies -- and employ a quantitative approach (social network analysis).

We recognize that these may at first blush seem like strange choices, given that we have introduced our research question in terms that highlighted the significance of Macaulay's 1963 study of non-contractual relations in business -- which explicitly eschewed attention to formal contract, and which was decidedly qualitative and interview-based in its selection of empirical material to analyze. There is, however, a logic to our choice.

The literature that has grown up in sociology around non-contractual relations in business has taken its impetus from the studies like that by Macaulay, from Granovetter's theorizing of embeddedness, or from Powell's descriptions of networks that are "neither market nor hierarchy" -- all of which are essentially qualitative and focused on the social embedding of contract. The subsequent development of that literature, however, has sought in many cases to expand those initial insights to populations of firms with the tools of social network analysis. Key studies here include for example the the aforementioned works by Gulati (1995) and by Gulati and Gargiulo (1999) showing that firms sharing a common partner are likely to form collaborative relations among themselves. Those and similar studies generally aim to look beyond dyadic relations to understand how a network *context* affects patterns of organizational behavior. They are thus attentive to what Granovetter refers to as "structural embeddedness," by which he meant extent to which a "dyad's mutual contacts are connected to one another" (Granovetter, 1992: 35). They often rely as well (albeit sometimes only implicitly) on a distinction drawn by Joel Podolny. Podolny, in an important 2001 paper, draws an important distinction between networks as the "pipes" and the "prisms" of the market.

These two dimensions are by no means mutually exclusive to the significance of a particular network. The network as "pipes," Podolny (2001: 33-34) wrote, references the "channels or conduits through which 'market stuff' flows, where 'market stuff' encompasses information about exchange opportunities as well as the actual goods, services, and payments that are transferred between buyer and seller." The network as prism, by contrast, recognizes that ties are often visible to third parties, and that this matters. Podolny(2001: 34) explains: "In this second view ..., the presence (or absence) of a tie between two market actors is an informational cue on which others rely to make inferences about the underlying quality of one or both of the market actors." These dimensions, when combined, can help considerably to understand patterns of inter-organizational relations. However, in studies to date the 'market' stuff examined is generally just the "good stuff" -- the stuff of collaboration; and the ties present (or absent) are generally just the pipes through which that good stuff is flowing.

Our own strategy, given the development of these tools and given our desire to bring attention back to the multiplexity of inter-firm relations, is to run in the tack opposite that taken by

MaCaulay in his seminal 1963 paper. We have argued that a literature rooted in qualitative analyses has since grown to include more formal analyses. And while much of our own research is qualitative and interpretive (see e.g. Whitford 2005), in this case we believe it would be fruitful to move in the opposite direction - that is, to use the formal tools to develop questions and hypotheses to be investigated further by means of less blunt empirical and methodological tools, including especially interviews and case studies. Our arguments are thus built around an *joint* analysis of collaboration *and* conflict networks -- where the former is operationalized as the signing of a former alliance, the latter as the filing of litigation. These "markers" of collaboration and conflict are not, of course, coextensive with collaboration and conflict. However, consistent with the imagery of the network as prism, they have the virtue of making cooperation and conflict visible to third parties. We hence analyze them at three levels. We look first at the dyadic level, which treats them as pipes -- but allows for good and bad "stuff" to flow. We turn then to a more prismic triadic and the regional level analysis.

The Setting

Strategic alliances and joint ventures are commonly-examined forms of inter-organizational collaboration. According to extant research, firms engaging in strategic alliances and joint ventures often acquire access to new knowledge and thick information, gain legitimacy and status, and reduce uncertainties and risks (Podolny & Page 1998, Powell 1990, for a review). Inter-organizational collaboration is particularly important for firms whose competiveness hinges on innovation ability and adaptability to high uncertainty. High-technology sectors such as computer and biotechnology are generally characterized by a high degree of competition. Unsurprisingly, many important empirical studies take these high-technology industries as attractive empirical testing grounds (e.g., Powell et al. 1996, 2005; Stuart & Podolny 1999; Saxenian 1994). Meanwhile, firms in these high-technology industries frequently use litigation, especially intellectual property and anti-trust litigation, as a competition strategy to construct market entry barriers for competitors. Litigation is a classical sort of -- and measure of -- conflictual relationships between companies. The prevalence of strategic alliances and lawsuits in the high-technology industries hence provide fertile ground for a preliminary analysis of the dynamics of collaboration and conflict.

This study investigates a population of internationally important semiconductor companies tracked by IC Insights, an institute specialized in the global semiconductor industry. It includes 231 semiconductor companies, all of which are globally prominent (though mainly concentrated in a small number of countries).[6] The period under examination runs from 2000 to 2010. The strategic alliance data are collected from SDC Platinum Database, which is the most commonly-used database concerning strategic alliances. The intellectual property and anti-trust litigation data are from the following sources: (1) Lex Machina: it is a database originally created by the Stanford Program in Law, Science and Technology; Lex Machina focuses on intellectual property rights and anti-trust lawsuits in the United States, the major litigation battlefield of the

[6] For the nationality distribution of the 231 companies, see Appendix. The US-based companies account for 45% of the sample firms. According to the ranking released by iSuppli, an authoritative source in the industry, about 48% of the top 25 semiconductor companies in the world are US-based companies.

global semiconductor companies; (2) LexisNexis: it covers lawsuits in the jurisdictions of the United State, Canada, the European Union and a number of other jurisdictions;[7] (3) East Asian jurisdictions: the lawsuits in Taiwan, Japan and China are collected from specific databases in these jurisdictions.[8] Although there may be lawsuits in other jurisdictions uncovered in this study, the omission is unlikely to significantly affect the result because the United States is the main battlefield and 94% of the sample firms are incorporated in the covered jurisdictions.[9]

Dyads

Scholars have long been interested in the relationship between contract and collaboration (trust). There is evidence, for example, that contracts -- as a form of formal/external control -- can impair trust and crowd out more intrinsic reasons for collaboration (Macaulay 1963, Sitkin and Roth 1993, Deci and Ryan 1985, Fehr and Gachter 2000, Frey 1997, Taylor 1987, Lubell and Scholz 2001, Malhotra and Murnighan 2002, Tenbrunsel and Messick 1999).[10] In other words, not only is there is putative incompatibility between invocation of legal sanction and collaboration, but the actual or even potential use of legal sanctions potentially impedes or at least conditions collaboration. As Macaulay (1963) showed -- and as Bernstein (1992), Cheit & Gersen (2000), Kenworthy et al. (1996), (etc.) have confirmed, firms seldom use legal sanctions as a preferred strategy in solving disputes. In-house counsels are called into the dispute settlements in a relatively late stage when managers cannot solve the disputes themselves through give-and-take negotiations. When a dispute materializes into a formal lawsuit, it implies the firms fail to work out the problem internally, an indicator of distrust and serious conflict. Thus, in order to preserve trust and collaboration willingness (plus to avoid the high litigation costs), we might expect alliance partners to be unlikely to initiate litigation against each other.

In our data, there are 671 alliance relations (non-directional) and 206 litigation relations (directional) among the 231 companies. Two companies may have repeated alliance or litigation relations. Each company on average has 5.81 alliance relations and 1.78 litigation relations. Each company on average has 2.98 alliance partners and 1.38 litigation enemies. The findings thus confirm, as expected, that litigation relations are considerably less common than alliance relations. The alliance relations and litigation relations together constitute a network of the 231 companies, as illustrated in [Figure 1] below. In [Figure 1], a blue tie indicates there is an alliance relation between two companies, a red tie indicates a litigation relation between the companies, and a black tie indicates there are alliance *and* litigation relations between the companies. There are only 13 mixed alliance-and-litigation ties (black ties). In other words, few

[7] The database covers jurisdictions related to the sample firms including US, Canada, EU, Australia, Malaysia, UK, and Hong Kong.
[8] For Taiwan, http://jirs.judicial.gov.tw/Index.htm; for Japan, LexisNexis Japan; for China, http://vip.chinalawinfo.com/case/. These three countries are the jurisdictions besides the United States in which the sample firms are mainly concentrated.
[9] Note that there are in total only 6 lawsuits in the jurisdictions of Taiwan, Japan, and China. In other words, most legal actions happen in the US jurisdiction.
[10] Other scholars however argue that contracts can help trust formation. For example, Lazzarini, Milller and Zenger (2008) argue whether the use of contracts would hurt relationships depends on social uncertainty and exchange value uncertainty.

companies mix alliance and litigation relations with another company. Companies that have litigation relations are unlikely to form alliance relations with each other, while companies having alliance relations are unlikely to engage in litigation against each other.

[Insert Figure 1 Here]

Though rare relative to the population, it is nonetheless interesting to analyze the 13 alliance-and-litigation relations (the black ties in [Figure 1]). [Table 1] below shows the details of the 13 alliance-and-litigation relations. Nine of the 13 alliance-and-litigation relations have a sequence pattern in which an alliance relation predates a litigation relation -- which naturally raises suspicions of alliances gone bad. However, in fact, all *nine* litigation cases arose out of legal causes unrelated to the preexisting alliance relations.

Three of the 13 alliance-and-litigation relations have a pattern in which a litigation relation predates an alliance relation. The Zoran-MediaTek alliance was a settlement of litigation between the two companies. But the other two alliance relations (Freescale- STMicroelectronics and Philips-Fairchild) are unrelated to the preexisting legal suits. Their rarity, but existence, suggests that perhaps prior conflict -- or, the condition that lead to conflict -- render collaboration rare, but do not necessarily preclude the formation of collaborative relations.

The remaining instance is an approximate concurrence of litigation filing and alliance formation between Toshiba and Samsung. The cases are unrelated.

[Insert Table 1 Here]

Triads and Regions

In our data, alliance is more common than litigation, and the coexistence of alliance and litigation in an inter-organizational relation is uncommon but does occur. These finding are easily squared with extant theory. Most scholarship on network forms of organization hold that collaboration and litigation are tendentially -- but only tendentially -- antithetical, and recognize that those relations may be both tense and fluid. There is, for example, evidence that inter-firm collaborative relations (typically measured as joint ventures or strategic alliances) suffer high failure rates (Kogut 1989, Park & Russo 1996, Economist 1995:60). Alliance failures may be attributed to interfirm rivalry, managerial complexity/uncertainty, and to a lesser extent environmental factors (Park Ungson 2001; Kogut 1989; Parkhe 1993). Many collaborative relations are formed between actual or potential competitors. The presence of actual or potential competition makes the collaborative relation unstable because it increases opportunistic hazards and needs to adopt various forms of formal control to reduce opportunism. In such competitive collaboration, alliance partners would pursue short-term self-interests over long-term collaborative goals. Alternatively, collaboration may fail due to cultural dissimilarity, communication difficulties, and conflict between the parent partner and the alliance may reduce the binding strength or trust in the collaborative relation (Park & Ungson 2001). When a collaborative relation becomes unstable, it may reduce the need/desire to preserve trust and the

cooperative atmosphere between alliance partners. In such case, there would be less hesitation to resort to legal sanctions to govern inter-firm relations.

Our network analysis cannot discern between these multiple causes, at least at a dyadic level. However, it is notable that extant explanations for tensons in, and fluidity of, inter-firm relations turn on claims about the environment in which relations form (or fail to form). Relation formation is not, in short, just an internal process between two firms unaffected by their relations with third parties. Rather, as Gulati and Gargiulo (1999) show, alliance partners are likely to share common third-party partners. They do so for a variety of reasons. In part, existing partners can serve as “trusted informants," allowing firms to leverage their past dealings with a potential partner to reduce search costs as they seek new partners (Granovetter 1985: 490). Moreover, allying with common partners creates “a reputational lock-in” whereby good behavior is encouraged and bad behavior is deterred for the local reputation concern (Gulati & Gargiulo 1999: 1447). Such "collaboration cohesion" can reduce opportunism.

These effects, in network terms, are understood in terms of that highlight the salience of structural embeddedness (defined, again, as the extent to which a "dyad’s mutual contacts are connected to one another"; Granovetter, 1992: 35). To see them, we must move beyond the analysis of dyads to look also at triads and thus to think about those networks not just as "pipes" but also as "prisms" (Podolny 2001). It is here, in short, that we move beyond extant research that has well recognized the importance of structural embeddedness, but that has only examined them in the uniplex setting (i.e. collaborative relations). We look simultaneously at multiple relationship dimensions. In particular, we think that an analysis of the structural embedding of both conflict and collaboration can enrich the understanding of relation/network formation by incorporating what is referred to in the networks literature as "structural balance" and "structural imbalance." These concepts treat as analogous on the one side situations that are all "balanced": i.e. (i) the "friend of my friend is my friend"; (ii) the "enemy of my friend is my enemy"; (iii) or the "enemy of my enemy is my friend." Imbalanced situations include social structures in which: (i) the "enemy of my enemy is my enemy"; (ii) the "friend of my enemy is my friend"; or (iii) the "friend of my friend is my enemy".

Structural balance is generally held to be more stable than structural imbalance. Empirical evidence, though examined in the interstate not interfirm context, suggest that things may however be more complicated when we are speaking of corporate actors. Healy and Stein (1973) found that in the period of 1871-80 the Germany-Austria-Russia triad swung between balance and imbalance but converged towards balance in the late 1870s. However, they did find that structural imbalances are more likely to move towards balance, than balance were to move towards imbalances. McDonald and Rosecrance (1985) conversely found that a high percentage of structural imbalances sustained over time and some structural balances became imbalances, concluding that there was no swing to balance in the European system in the late 19th century.

More recently, Maoz et al. (2007) examined the dynamics between alliance and conflict between nation-states in the period of 1816-2001. They found that the allies of a state’s enemies and the enemies of a state’s allies are likely to become direct enemies of the state, which is consistent with intuition. Meanwhile, they also found that the number of past disputes between two states

has a positive effect on the probability of subsequent alliance formation, and both indirect enmity (two-degree) and direct (one-degree) enmity increases the probability of alliance formation, both which quite counter-intuitive. The findings in the interstate setting are insightful but might not be readily applicable to the interfirm setting. The conflict and collaboration dynamics in business might be different in international politics. There may be more social thickness and interpersonal ties in interfirm relations, which may make structural imbalances uncommon and hard to endure.

To examine structural balance and imbalance in the alliance-litigation network of [Figure 1], we have parsed into ten triangle types. They are shown in Figure 2A-J. They comprise the full set of combinations of alliance, litigation, and mixed relations. There are 619 triangles of all types in total.

[Insert Figure 2 Here]

Figure 2.A illustrates two companies (solid round nodes) are in an alliance relation and they share a common alliance partner (pattered round node). This type of triangle arises from "structural embeddedness" as illustrated by Gulati and Gargiulo (1999). Firms are likely to share common partners because it helps to reduce search costs and to alleviate opportunism risks. Prior or existing partners can serve as "trusted informants" who have past dealings with a potential partner (Granovetter 1985: 490). Also, such triangles create "a reputational lock-in" among the companies (Gulati & Gargiulo 1999: 1447). Firms in such triangle view each other as suitable and trustworthy alliance partners. In other words, there is *collaboration cohesion* in the triangle of Figure 2.A. The collaboration cohesion triangle is the most common type among these 231 semiconductor companies. There are 395 such collaboration cohesion triangles, accounting for 64% of all the triangles. The second most common triangle is a scenario where two firms in an alliance relationship are involved in litigation with a common third-party, as shown in Figure 2.B. It is a quite intuitive situation where friends have a common foe. The two alliance partners not only have internal collaboration cohesion but also external conflict consistency, briefly called *conflict-collaboration consistency*. There are 91 conflict-collaboration-consistency triangles among these 230 semiconductor companies.

The predominance of the collaboration cohesion triangles and conflict-collaboration consistency in our data is, of course, expected. There is considerable structural balance, which aligns consistent with past examinations of similar cases (never a bad thing!!). But it is not, notably, our only finding. If we look at Figure 2.D, we see the *conflict triangle*, a type of structural imbalance -- though the one that seems intuitively most likely (all-out-war).[11] Figure 2.D shows two firms suing against each other are also engaged in a litigation relation with a common third-party. In other words, it is a situation where foes have a common foe. The conflict triangle suggests the firms may have intense competition against each other in similar technology or market position. Such triangles, since balanced, would intuitively be the most common sort of finding with regard to litigation. Curiously, however, there are just 19 conflict triangles among the 231

[11] In social network analysis parlance, there are two types of relation –positive and negative--in structural balance/imbalance. When all the sides of a triad are positive (e.g. friendship, liking) or when two sides are negative (e.g. hostility, disliking) and one side is positive, the triad is considered as structural balance. But when all the sides of a triad are negative relations or when two sides are positive and one side is negative, the triad is defined as structural imbalance.

semiconductor companies. And when we look at Figure 2.C -- where the triad forms a *conflict-collaboration inconsistency* (a firm's friend may collaborate with the firm's enemy), we see instead a surprising high number of cases. There are 73 conflict-collaboration-inconsistency triangles, taking up 12% of all the triads. This suggests a possible source of instability in alliance relationships. The collaboration-conflict inconsistency suggests that firms perhaps use formal contracts to govern their collaboration relations in order to guard the possible flow of valuable information or technology to the enemy through the common friend.[12]

Among the ten types of triangles, conflict-collaboration consistency and conflict-collaboration inconsistency are the most interesting types and deserve more analysis. The conflict-collaboration consistency and inconsistency include subtypes because litigation relations are directional and there is a temporal sequence in the formation of alliance and litigation relations. [Table 3] shows the different patterns of relation formation of conflict-collaboration consistency and inconsistency.

[Insert Table 3 Here]

Our findings on conflict-collaboration consistency -- the intuitively common but empirically uncommon situation -- shows that the majority involved a situation where two companies formed an alliance first and were then sued by a third party in the same lawsuit [Table 3(A)]. In other words, alliance partners are sued, together, by a third-party. Because of information flows and resource sharing between alliance partners, a third-party may sue the alliance partners together in order to effectively protect its interests. The others involved situations where two companies were sued by a third-party in the same lawsuit but only subsequently formed an alliance [Table 3(B)], or a situation where the company first created an enemy through litigation and then created an alliance partner with another company and finally the company's enemy sued the company's friend [Table 3(C);where the friend of my enemy is my enemy].

In our findings on conflict-collaboration inconsistency, a majority – 57.5% -- of these triangle formation sequences involve a situation [Table 3(D)] where a company established alliances with two companies and then one of the company's alliance partners sued the other. They negate the hypothesis that a firm would avoid litigation against the friend of the firm's friend. The additional cases are comprised of situations where a company's alliance partner sued a third-

[12] The following types of triangle are of less theoretical and empirical importance. Figure 2.E shows two firms having an alliance-litigation-mixed relation share a common alliance partner. There are 17 triangles of such type. This type of triangle fundamentally can be viewed as a combination of the collaboration cohesion triangle in Figure 2.A and the collaboration-conflict inconsistency triangle in Figure 2.C. Figure 2.F shows two firms engaged an alliance-litigation-mixed relation have opposing relations with a common third-party. There are 14 triangles of such type. This type of triangle fundamentally is constituted of a collaboration-conflict-consistency triangle in Figure 2.B and a collaboration-conflict-inconsistency triangle in Figure 2.C. Figure 2.G is a type of triangle where two firms involved in an alliance-litigation-mixed relation sue a common third-party. Severn triangles belong to this type. Figure 2.H shows a scenario where two alliance partners both have an alliance-litigation-mixed relation with a common third party. The two alliance partners have internal coherence and external consistency, like the situation in Figure 2.B. There are only 2 triangles of this type. Figure 2.I shows a situation where two firms involved in a litigation relation have an alliance-litigation-mixed relation with a common third party. There is only one triangle of this type. Finally, Figure 2.J shows the three firms have an alliance-litigation-mixed relation with one another. This type of triangle does not happen among these 231 companies, however.

party and later on the third-party formed an alliance with the company [Table 3(E)], or where a company (the plaintiff company) sued another company (the defendant company) and the defendant company later on formed an alliance with a third-party, and finally the plaintiff company also collaborated with the third-party [Table 3(F)]. Both [Table 3(E) and 3(F)] show that a company can collaborate with the friend of the company's enemy.

Overall, the triadic analysis suggests that structural balance is more common than structural imbalance in inter-firm alliance-litigation relations, but there is enough structural imbalance to suggest some interesting avenues for deeper research. If we move beyond triads -- which are a very simple conceptual tool -- we can identify more such avenues. In reality, after all, a firm has collaborative or conflictual relations not only with two other firms but often with many other firms. There is multiplexity of relations among multiple companies. We thus look also at the dynamics of alliance and litigation at the regional (subgroup) level. We ask how likely firms in a strong cohesive alliance group are to sue each other. In other words, is there any collaboration space in which conflict is minimized or even excluded? Similarly, are there any conflict spaces in which collaboration does not exist? To answer these questions, this study uses the k-core method in social network analysis. A k-core is a subgraph in each node (i.e. each company in this study) is adjacent to at least a minimum number, k, of the other nodes in the subgraph (Wasserman & Faust 1994). A K-core is formed by recursively pruning the least-connected vertices (firms in this case), up to the number K. It is used to "disentangle the hierarchical structure of networks by progressively focusing on their central cores" (Alvarez-Hamelin et al. 2006).

The most straightforward finding from our analysis frames our study of K-cores. There are 206 litigation relations among the 231 companies. Litigation remains minimal in such alliance subgroups. It suggests there are some normative spaces in which litigation is avoided. But what are they? [Figure 3] shows the k-core subgraphs of the alliance network. There is a highly cohesive subgroup (a 10-core) in the alliance network. Again, a "10-core" is a restrictive subgraph, in which all firms that have less than 10 alliances with other firms in the dataset are removed. What remains is a very highly connected core of companies. The companies in the 10-core are all Japanese companies, as listed in [Table 4]. In fact, this 10-core is also a "10-clique," in which every company is connected with each other in this subgroup. This suggests quite strongly that culture matters in the formation of such highly cohesive subgroups. Business organization in Japan is well-known as a form of "alliance capitalism" (Gerlach 1997). Moreover, the Japanese society is relatively non-litigious (Wollschlager 1997),[13] and there is but one lawsuit (between Toshiba and Mitsubishi) found in this highly cohesive subgroup constituted of Japanese companies.

[Insert Figure 3 Here]
[Insert Table 4 Here]

[13] Some legal scholars have argued that the cultural preferences are overstated. The low litigation rate in China has something to do with the legal institutions in Japan. See e.g. Ginsburg and Hoetker (2006); Ramseyer and Nakazato (1989).

This tendency to collaboration and to avoid litigation creates cohesiveness among the Japanese companies. It also raises more general questions about the role of the Japanese companies in cementing the relations in the alliance network, given also the fact that Japanese companies account for just 12.5% of all the sample companies but their removal from the network would reduce network density by 50%. We have hence looked at other K-cores to see how and if things change as other nationalities embed in the network core. The second most cohesive subgroups are 7-cores, in which each company has alliance relations with at least 7 other companies in the subgroup. There are 12 companies involved in the 7 cores. Intel is the only non-Japanese companies, as shown in [Table 4]. Still, in the 7 cores, there is only one lawsuit (between Toshiba and Mitsubishi) among the 12 companies. The third most cohesive subgroups are 6 cores, involving 25 companies. There is more nationality diversity in the 6 cores, including companies from Japan, the United States, the United Kingdom, Germany, Korea, Switzerland and Taiwan. There are 5 lawsuits found in the 6 cores.[14] These 5 lawsuits are either between two Japanese companies or between a Japanese company and a Korean company (i.e. Samsung). In other words, the existence of the 5 lawsuits is not because non-Japanese companies, especially companies coming from litigious societies such as the United States, join the alliance subgroups. This suggests that national culture does not determine the rise of litigation in a cohesive group.

Finally, if we look at the K-core subgraphs of the *litigation* network [Figure 4], we see that the most interconnected subgroups are 3-cores. The largest coreness value (3) in the litigation network is much smaller than the largest coreness value (10) in the alliance network. There are 31 companies involved in the 3 cores. [Table 5] lists the companies involved in the 3 cores. About 58% of them are US companies and 42% are non-US companies. Unlike the most cohesive alliance subgroups, which are mainly composed of Japanese companies, the most conflictual subgroups mainly include American companies.

[Insert Figure 4 Here]
[Insert Table 5 Here]

Discussion and Conclusion

This is a preliminary study -- and is at this point but a working paper. We first described the development of a literature in sociology that owes a substantial debt to Stewart Macaulay's 1963 article on "non-contractual relations in business." That literature, we argued, drew heavily on the underlying insight in Macaulay's article, which is that there is in fact no bright line between administration and contract. Each is shaped by its embedding in the larger social and institutional surround -- and scholars ignore that embedding at their peril. We then described the way in which that insight has been integrated into a sociological literature that has endeavored to identify the contours of "networks" that are neither market nor hierarchy, "nor some mongrel

[14] The 5 lawsuits are: between Matsushita and Samsung, between Toshiba and Samsung, between Denso and Mitsubishi, between Samsung and Sharp, and between Toshiba and Mitsubishi.

hybrid, but a distinctly different form" (Powell 1990: 299). We explained that the sociological literature has been marked by its positioning against transactions-cost economics, and has thus focused primarily on the perceived need to show that collaborative relations between organizations -- "networks" -- are far more distinctive, and far more common, than Oliver Williamson's presumption that claim that actors are intrinsically opportunistic would lead us to expect. We argued that this positioning has been fruitful in the main, but that it has also generated an inattention to some of the lawyerly considerations that sat naturally in Macaulay's 1963 paper.

In particular, we have shown that the sociological literature has been primarily interested in the blurring of organizational boundaries and an ensuing -- and profound -- set of transformations in patterns of inter-organizational relations across the last few decades. Many important quantitative empirical studies have relied, either implicitly or explicitly, on the presumption that contracts of particular sorts -- including especially joint-venture and other alliance contracts -- suggest that organizational boundaries have somehow been blurred (e.g., Gulati 2004, Baker et al. 2008). This only made sense in light of an idea for which sociology is indebted to relational contract theory: contracts are not just documents spelling out what is to done should various contingencies come to pass; they are also social artifacts (Suchman 2003). And while the assumption that has underlain those more formal studies is sustained by cognate qualitative examinations of inter-organizational dynamics showing that particular sorts of contracts do in fact suggest some blurring of an organizational boundary, quantitative studies have made little of the additional finding -- implicit in Macaulay's 1963 paper and present also in more recent work -- that the blurring of organizational boundaries is marked not just by cooperation, but also by conflict (see e.g. Whitford 2005; Schrank and Whitford 2011; Dirks et al 2009, Ferrin et al 2007, Lewick & Bunker 1996, Nakayachi & Watabe 2005, Bottom et al 2002).

In our own study, we have sought to bring some of these insights from qualitative work into a social network analysis of inter-organizational alliances in the semi-conductor industry. Just as others in this literature have relied on the formalization of an alliance as an indicator of collaboration -- and thus of some blurring of the organizational boundary -- we have turned to a formal market, litigation, as an indicator of conflict. We are of course well aware that most conflict in the relations that interest us and other sociologists does not culminate in litigation. It is for this reason that we have in our study paid little attention to dyads -- analyzing them primarily as a sort of "due diligence" to verify our and others' expectation that alliance and litigation will combine in the same relation only rarely. We have instead focused primarily on "triads" and "regions" in an effort to develop insights into the ways in which interactions between alliance and litigation -- as cooperation and conflict visible to third parties (i.e. network as prism)-- might affect norms of cooperation and conflict in network space.

We have also some provocative findings that, we hope, might structure future efforts to understand the multiplexity of relations between firms in those instances where they are marked neither by administration nor contract, but by something in between. Our analysis of dyads, as just noted, confirms the utility of recent scholarly interest in the intermingling of cooperation and conflict in particular relations is spot-on. Certainly, alliance partners seldom initiate litigation against each other. But the rarity is not non-existence and still begs explanation. And, we think,

our analysis of triads and regions can help both to structure some of that explanation and to open new questions. We offer, for example, a potential new explanatory factor in explaining why firms sue each other against a background of “non-contractual” relations. Most scholarship on litigation focuses on the general economic or institutional environment that a firm faces. Our study suggests there may be a “structural” factor in explaining the use or nonuse of business litigation. For instance, the triadic analysis in this study indicates that the use or nonuse of litigation can be affected by a firm’s relation with a third-party. The regional analysis implies that there may be different normative spaces in an industry. Firms embedded in the different normative spaces would follow different sets of norms to govern their behavior.

In general, we have shown that structural balance, while common, is hardly ubiquitous. The quantitative salience of conflict-collaboration inconsistency deserves future research. Why do firms construct alliance with friends of their litigation enemies? And we have shown, with our analysis of cores, that there are spaces in the network in which collaboration is common and litigation rare, and others in which the opposite holds. What structures such spaces? The national origin of particular companies certainly plays some role, but it is not determinative. Does entry into a network "core" dominated by collaborative firms reduce the propensity to conflict, net of culture? Does it channel that conflict so that it occurs by way other channels? Such questions can only be answered, of course, with forms of analysis that operate not just at "forest level" (as does social network analysis), but that include observation also at the level of the "trees." We hope, however, that our descriptions of the forest, and our preliminary examination of the multiplexity of inter-organizational relations in the semi-conductor industry can help to frame that research, and to remind that collaboration and conflict are not opposite -- one cognate to contract, the other to suit -- but part and parcel of the relational ecology of a modern economy.

References

Alvarez-Hamelin I, Dall'Asta L, Barrat A, Vespignani A (2006) Large scale networks fingerprinting and visualization using the k-core decomposition. In: Weiss Y, Scholkopf B, Platt J, editors. *Advances in neural information processing systems*. Cambridge (Massachusetts): MIT Press. pp. 41–50.

Baker, G. P., Gibbons, R., & Murphy, K. J. (2008). Strategic Alliances: Bridges between "Islands of Conscious Power". *Journal of Japanese International Economies, 22*(2), 146-163.

Bernstein, L. (1992). Opting out of the Legal System: Extralegal Contractual Relations in the Diamond Industry. *Journal of Legal Studies, 21*(1), 115-157.

Bottom, W., Gibson, K., Daniels, S., & Murnigham, J. K. (2002). When Talk is not Cheap: Substantive Penance and Expessions of Intent in Rebuilding Cooperation. *Organization Science, 13*, 497-513.

Cheit, R. E., & Gersen, J. E. (2000). When Businesses Sue Each Other: An Empirical Study of State Court Litigation. *Law and Social Inquiry, 25*(3), 789-816.

Deci, E. L., & Ryan, R. M. (1985). *Instrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum.

Dirks, K. T., Lewicki, R. J., & Zaheer, A. (2009). Repairing Relationships within and Between Organizations: Building a Conceptual Foundation. *Academy of Management Review, 34*(1), 68-84.

Dunworth, T., & Rogers, J. (1996). Corporations in Court: Big Business Litigation in U.S. Federal Courts, 1971-1991. *Law and Social Inquiry, 21*(3), 497-592.

Economist. (1995). Airline Alliances: Flying in Formation. *Economist, 336*, 59-60.

Fehr, E., & Gachter, S. (2000). Do Incentive Contracts Crowd Out Voluntary Cooperation? *Working Paper, Institute for Empirical Research in Economics, University of Zurich, Switzerland*.

Ferrin, D. L., Bligh, M., & Kohles, J. (2007). Can I Trust You to Trust me? A Theory of Trust, Monitoring, and Cooperation in Interpersonal and Intergroup Relationships. *Group and Organization Management, 32*, 465-499.

Fey, B. (1997). A Constitution for Knaves Crowds Out Civic Virtues. *Economic Journal, 107*, 1043-1053.

Galanter, M., Macaulay, S., Palay, T., & Rogers, J. (1991). The Transformation of American Business Disputing: A Sketch of the Wisconsin Project. *Dispute Process Research Program Working Paper DPRP10-6, Insittute of Legal Studies, Univeristy of Wisconsin Law School*.

Gargiulo, R. G. (1999). Where Do Interorganizational Networks Come From? *American Journal of Sociology, 104*(5), 1439-1438.

Gerlach, M. L. (1997). *Alliance Capitalism.* University of California Press.

Gersen, J. E. (1999). Markets and Corporate Conflict: A Substitute-Cost Approach to Business Litigation. *Law and Social Inquiry, 24*(3), 589-609.

Ginsburg, T., & Hoetker, G. (2006). The Unreluctant Litigant? An Empirical Analysis of Japan's Turn to Litigation. *Journal of Legal Studies, 35*, 31-59.

Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology, 91*, 481-510.

Gulati, R. (1995). Social Structure and Alliance Formation Patterns: A Longitudinal Analysis. *Administrative Science Quarterly, 40*(4), 619-652.

Gulati, R. (2004). Alliances and Networks. In J. J. ed., *Strategic Alliances: Theory and Evidence* (pp. 378-412). Oxford University Press.

Healy, B., & Stein, A. (1973). The Balance of Power in International History: Theory and Reality. *Journal of Conflict Resolution, 17*(1), 33-61.

Hitt, M. A., Ahlstrom, D., Dacin, M. T., Levitas, E., & Svobodina, L. (2004). The Institutional Effects on Strategic Alliance Partner Selection in Transition Economies: China vs. Russia. *15*(2), 173-185.

Jacobs, J. A. (2005). ASR's Greatest Hits. *American Sociological Review, 70*, 1-3.

Kenworthy, L., Macaulay, S., & Rogers, J. (1996). "The More Things Change...": Business Litigation and Governance in the Automobile Industry. *Law and Social Inquiry, 21*(3), 631-678.

Kogut, B. (1989). The Stability of Joint Ventures: Reciprocity and Competitive Rivalry. *Journal of Industrial Economics, 38*(2), 183-198.

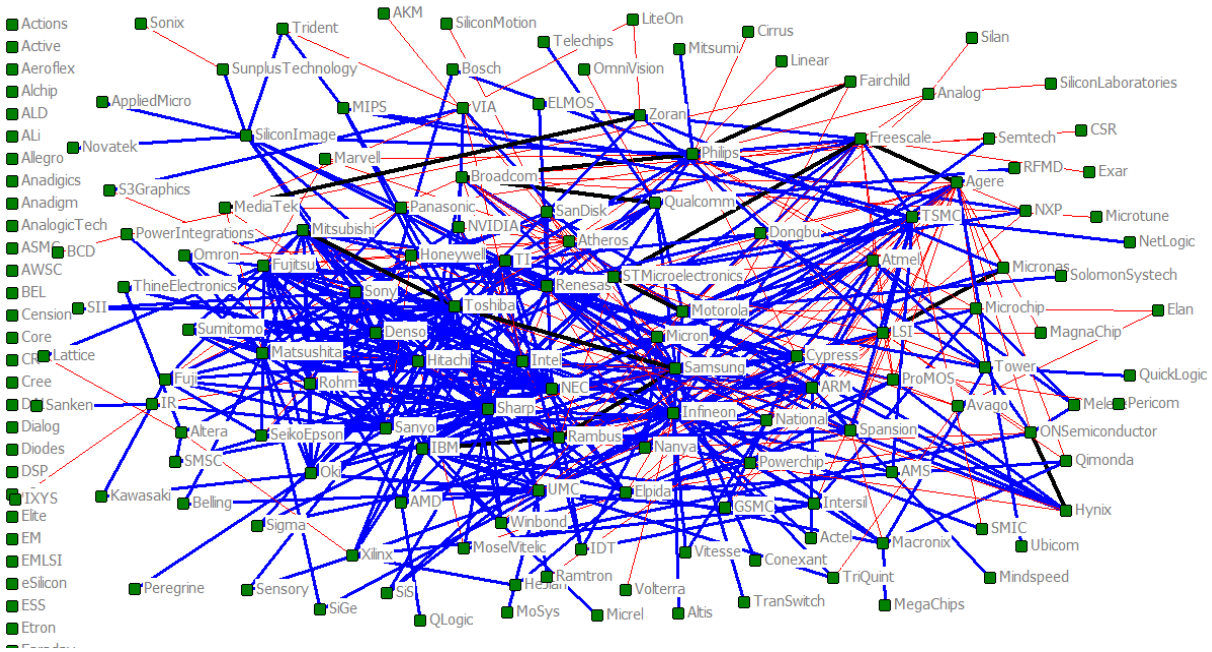
Lazzarini, S. G., Miller, G. J., & Zenger, T. R. (2008). Dealing with the Paradox of Embeddedness: The Role of Contracts and Trust in Facilitating Movement Out of Committed Relationships. *Organization Science, 19*(5), 709-728.

Lewicki, R., & Bunker, B. (1996). Developing and Maintaining Trust in Work Relationships. In R. Kramer, & T. R. (eds.), *Trust in Organizations: Frontiers of Theory and Research* (pp. 114-139). Thousand Oaks, California: Sage.

Lincoln, J. R., & Gerlach, M. L. (2004). *Japan's Network Economy: Structure, Persistence, and Change.* Cambridge University Press.
Lubell, M., & Scholz, J. T. (2001). Cooperation, Reciprocity, and the Collective-Action Heuristic. *American Journal of Politcal Science, 45*, 160-178.
Macaulay, S. (1963). Non-Contractual Relations in Business: A Preliminary Study. *American Sociological Review, 28*, 57-67.
Malhotra, D., & Murnighan, J. K. (2002). The Effects of Contracts on Interpersonal Trust. *Administrative Science Quarterly, 47*, 534-559.
Maoz, Z., Terris, L. G., Kuperman, R. D., & Talmud, I. (2007). What Is the Enemy of My Enemy? Causes and Consequences of Inbalanced International Relations, 1816-2001. *Journal of Politics, 69*(1), 100-115.
McDonald, H. B., & Rosecrance, R. (1985). Alliance and Structural Balance in the International System: A Reinterpretation. *Journal of Conflict Resolution, 29*(1), 57-82.
Nakayachi, K., & Watabe, M. (2005). Restoring Trustworthiness After Adverse Events: The Signaling Effects of Voluntary "Hostage Posting" on Trust. *Organizational Behavior and Human Decision Processes, 97*, 1-17.
Park, S. H., & Ungson, G. R. (2001). Interfirm Rivalry and Managerial Complexity: A Conceptual Framework of Alliance Failure. *Organization Science, 12*(1), 37-53.
Parkhe, A. (1993). "Messy" Research, Methodolofical Predisposition, and Theory Development in International Joint Ventures. *Academy of Management Review, 18*, 227-268.
Piore, M., & Sabel, C. (1986). *The Second Industrial Divide.* Basic Books.
Podolny, J. M. (2001). Networks as the Pipes and Prisms of the Market. *American Journal of Sociology, 1*, 33-60.
Podolny, J. M., & Page, K. L. (1998). Network Forms of Organization. *Annual Review of Sociology, 24*, 57-76.
Powell, W. W. (1990). Neither Market nor Hierarchy. *Reseach in Organizational Behavior, 12*, 295-336.
Ramseyer, J. M., & Nakazato, M. (1989). The Rational Litigant: Settlement Amounts and Verdict Rates in Japan. *Journal of Legal Studies, 18*, 263-.
Saxenian, A. (1994). *Regional Advantage: Culture and Competition in Silicon Valley and Route 128.* Cambridge, MA: Harvard University Press.
Schrank, A., & Whitford, J. (2011). The Anatomy of Network Failure. *Sociological Theory*, Forthcoming.
Steve Cropper, M. E. (2008). *The Oxford Handbook of Inter-Organizational Relations.* Oxford University Press.
Stuart, T. E. (1998). Network Positions and Propensities to Collaborate: An Investigation of Strategic Alliance Formation in a High-Technology Industry. *Administrative Science Quarterly, 43*(3), 668-698.
Stuart, T. E., & Podolny, J. (1999). Positional Causes and Correlates of. Strategic Alliances in the Semiconductor Industry. *Research in the Sociology of Organizations, 16*, 161-182.
Suchman, M. (2003). The Contract as Social Artifact. *Law & Society Review, 37*(1), 91-142.
Suchman, M. C., & Cahill, M. L. (n.d.). The Hired Gun as Facilitator: Lawyers and the Suppression of Business Disputes in Sillicon Valley. *Law and Social Inquiry, 21*(3), 679-712.
Taylor, M. (1987). *The Possibility of Cooperation.* New York: Cambridge University Press.

Tenbrunsel, A. E., & Messick, D. (1999). Sanctioning Systems, Decision Frames, and Cooperation. *Administrative Science Quarterly, 44*, 684-707.
Trapido, D. (2007). Competitive Embeddedness and the Emergence of Interfirm Cooperation. *Social Forces, 86*(1), 165-191.
Wasserman, S., & Faust, K. (1994). *Social Network Analysis.* Cambridge University Press.
Whitford, J. D. (2005). *The New Old Economy.* Oxford University Press.
Wollschlager, C. (1997). Historical Trends of Civil Litigation in Japan, Arizona, Sweden, and Germany: Japanese Legal Culture in Light of Judicial Statistics. In H. B. ed., *JAPAN: ECONOMIC SUCCESS AND LEGAL SYSTEM.*

[Figure 1] The Collaboration and Conflict Network of the Global Semiconductor Companies, 2000-2010



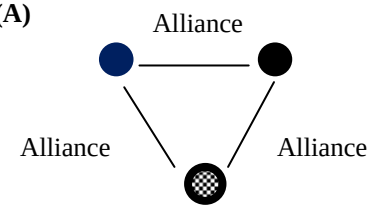
Note: The red ties indicate litigation relations; the blue ties indicate alliance relations; the black ties indicate alliance-and-litigation relations.

[Table 2] Semiconductor Companies with Alliance-and-Litigation Relations, 2000-2010

Companies in Relation		Litigation Filing Date	Litigation End Date	Alliance Date	Event Sequence	Notes
Broadcom	Qualcom	5/18/2005	4/28/2009	3Q2003	Alliance>>>Litigation	Litigation unrelated to previous alliance (joint product development and marketing)
Philips	Broadcom	12/17/2007	9/18/2009	2/17/2004	Alliance>>>Litigation	Litigation unrelated to previous alliance (joint product development)
LSI	Micronas	4/21/2008	N/A	8/30/2006	Alliance>>>Litigation	Litigation unrelated to previous alliance (joint product development)
Agere	Freescale	4/21/2008	N/A	Jun2002	Alliance>>>Litigation	Litigation unrelated to previous alliance (alliance terminated in June 2006 because both parties lacked interest)
Rambus	Samsung	1/25/2005	N/A	2/24/2003	Alliance>>>Litigation	Litigation unrelated to previous alliance
IBM	Rambus	9/7/2010	N/A	3/17/2006	Alliance>>>Litigation	Litigation unrelated to previous alliance
Motorola	STMicroelectronics	3/4/2003	9/1/2004	2/2/2002	Alliance>>>Litigation	Litigation unrelated to previous alliance
OnSemiconductor	Hynix	10/18/2010	1/5/2011	6/19/2003	Alliance>>>Litigation	Litigation unrelated to previous alliance
Mitsubishi	Toshiba	2010	N/A	2000/2001/2002	Alliance>>>Litigation	Litigation unrelated to previous alliances
Freescale	STMicroelectronics	3/4/2003	9/1/2004	1Q2006	Litigation>>>Alliance	Alliance (joint product development) unrelated to previous litigation
Philips	Fairchild	10/2/2000	1/24/2002	Sep2002	Litigation>>>Alliance	Alliance unrelated to previous litigation (joint marketing)
Zoran	MediaTek	6/29/2004	1/27/2006	1Q2006	Litigation>>>Alliance	Alliance (licensing agreement) as a result of litigation
Toshiba	Samsung	4/26/2002	9/27/2002	5/26/2002	Concurrence?	Alliance unrelated to litigation (litigation due to an alliance since 1993)

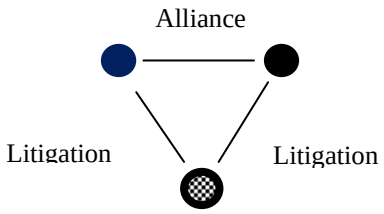
[Figure 2] Types of Alliance and Litigation Triangles

(A)



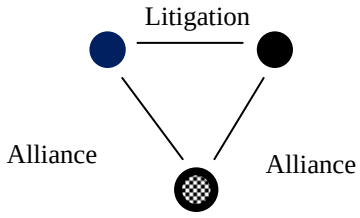
Collaboration Cohesion

(B)



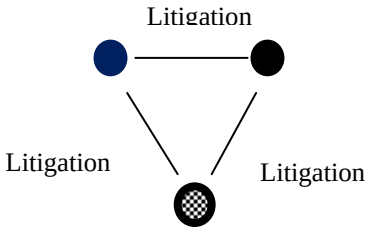
Conflict-Collaboration Consistency

(C)



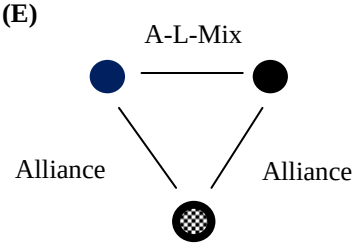
Conflict-Collaboration Inconsistency

(D)

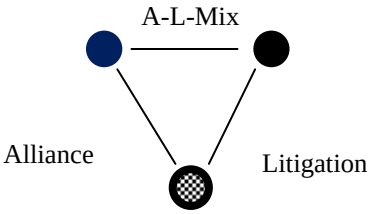


Conflict Triangle

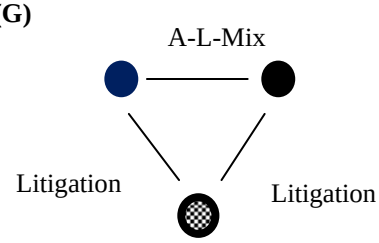
(E)



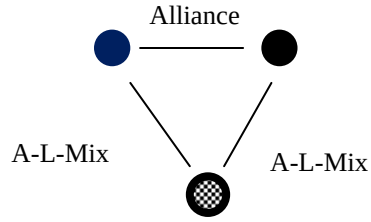
(F)



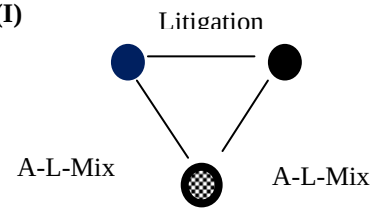
(G)



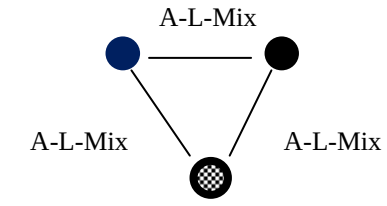
(H)



(I)



(J)



[Table 3] Patterns of Relation Formation

Triangle Type	No. of Sequence (%)	Subtypes

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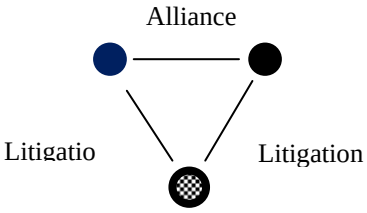
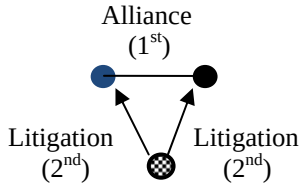
<tr><td rowspan="3"> 

Conflict-Collaboration Consistency</td><td>67
(73.6%)</td><td>(A) 
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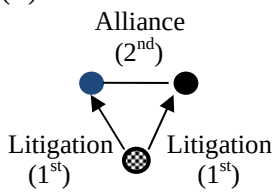
<tr><td>16
(17.6%)</td><td>(B) 
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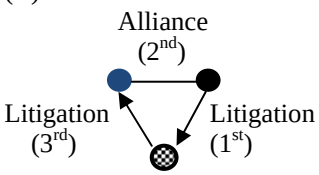
(8.8%)</td><td>(C) 
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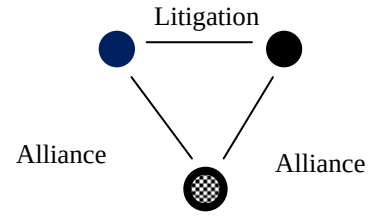
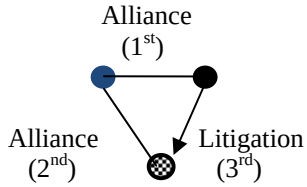
<tr><td></td><td>91
(100%)</td><td></td></tr>
<tr><td rowspan="3"> 

Conflict-Collaboration Inconsistency</td><td>42
(57.5%)</td><td>(D) 
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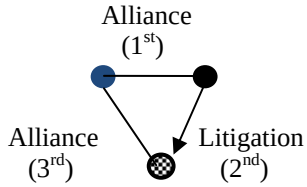
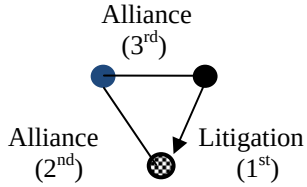
<tr><td>15
(20.5%)</td><td>(E) 
</td></tr>
<tr><td>16
(22%)</td><td>(F) 
</td></tr>
<tr><td></td><td>73
(100%)</td><td></td></tr>
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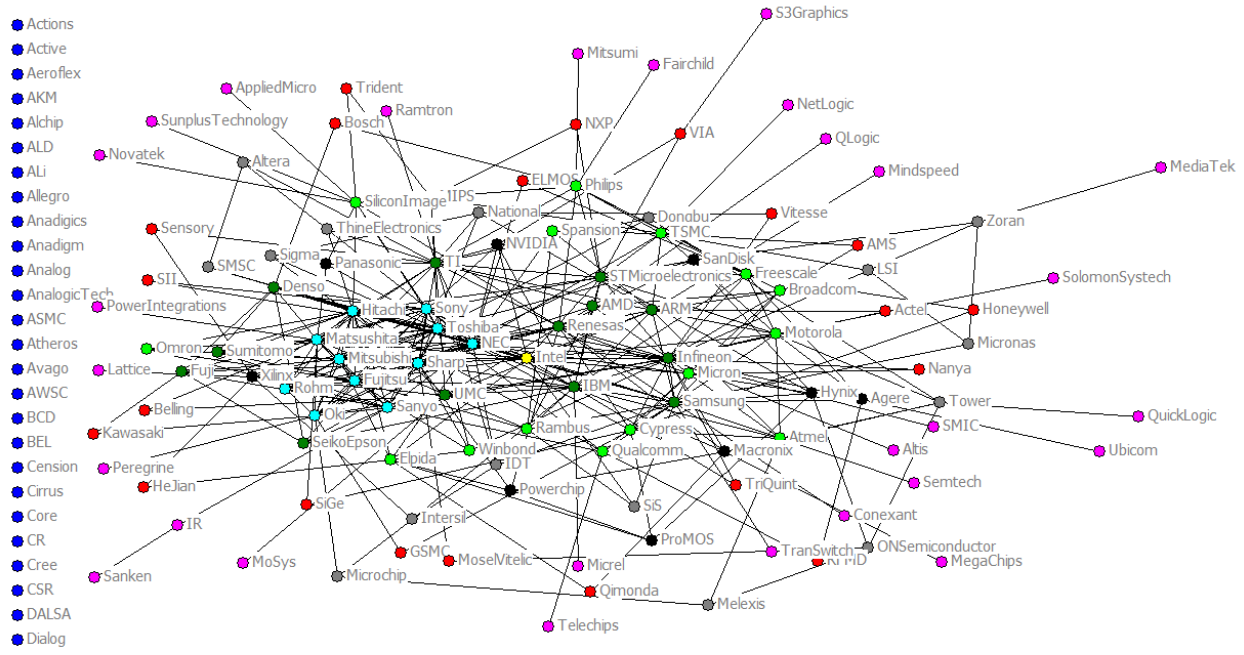
[Figure 2] Alliance K-core



Coreness Values

10 7 6 5 4 3 2 1 0

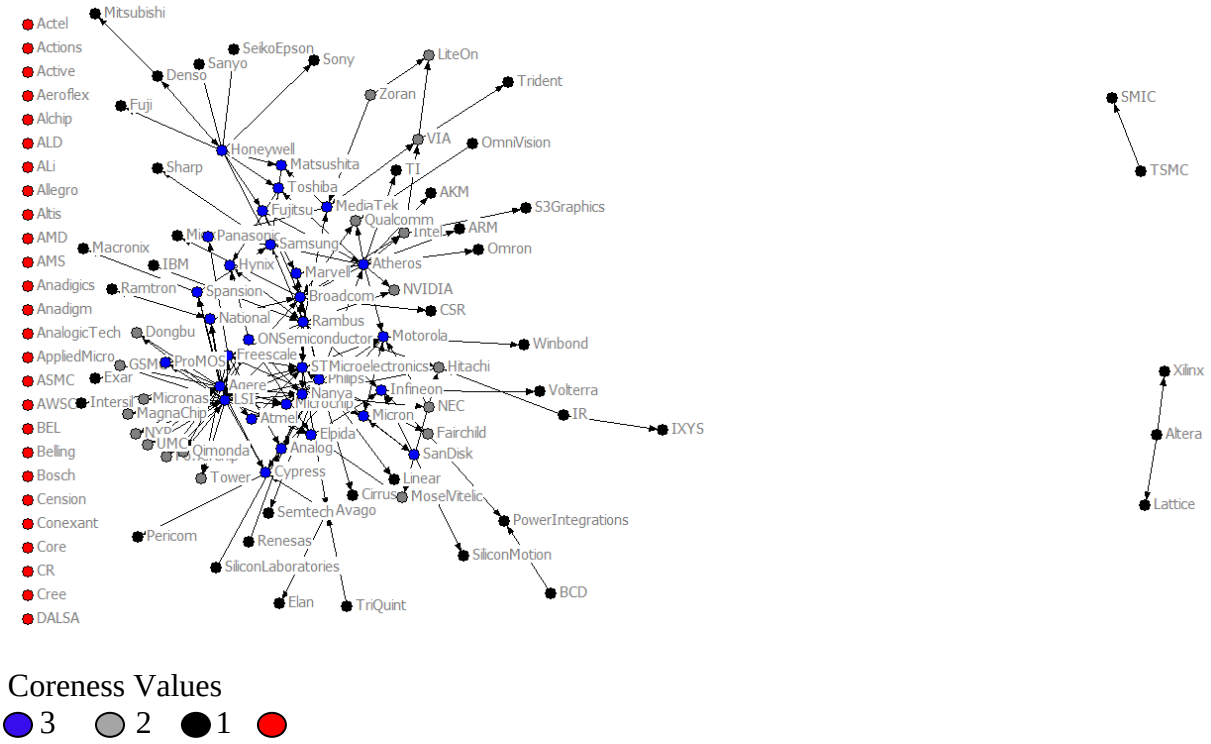
[Table 4] Companies with the Highest Coreness Values in the Alliance Network

Company Name	Country	Coreness Value
Fujitsu	Japan	10
Hitachi	Japan	10
Matsushita	Japan	10
Mitsubishi	Japan	10
NEC	Japan	10
Oki	Japan	10
Rohm	Japan	10
Sanyo	Japan	10
Sharp	Japan	10
Sony	Japan	10
Toshiba	Japan	10
Intel	USA	7
AMD	USA	6
ARM	UK	6
Denso	Japan	6
Fuji	Japan	6
IBM	USA	6
Infineon	Germany	6
Renesas	Japan	6
Samsung	Korea	6
SeikoEpson	Japan	6
STMicroelectronics	Switzerland	6
Sumitomo	Japan	6
TI	USA	6
UMC	Taiwan	6
Atmel	USA	5
Broadcom	USA	5
Cypress	USA	5
Elpida	Japan	5
Freescale	USA	5
Micron	USA	5
Motorola	USA	5
Omron	Japan	5
Philips	Netherlands	5
Qualcomm	USA	5
Rambus	USA	5
SiliconImage	USA	5
Spansion	USA	5
TSMC	Taiwan	5

Winbond	Taiwan	5
Agere	USA	4
Hynix	Korea	4
Macronix	Taiwan	4
NVIDIA	USA	4
Panasonic	Japan	4
Powerchip	Taiwan	4
ProMOS	Taiwan	4
SanDisk	USA	4
Xilinx	USA	4
Altera	USA	3
Dongbu	Korea	3
IDT	USA	3
Intersil	USA	3
LSI	USA	3
Melexis	Belgium	3
Microchip	USA	3
Micronas	Germany	3
MIPS	USA	3
National	USA	3
ONSemiconductor	USA	3
Sigma	USA	3
SiS	Taiwan	3
SMSC	USA	3
ThineElectronics	Japan	3
Tower	Isreal	3
Zoran	USA	3
Actel	USA	2
AMS	USA	2
Belling	China	2
Bosch	Germany	2
ELMOS	Germany	2
GSMC	China	2
HeJian	China	2
Honeywell	USA	2
Kawasaki	Japan	2
MoselVitelic	Taiwan	2
Nanya	Taiwan	2
NXP	Netherlands	2
Qimonda	Germany	2

RFMD	USA	2
Sensory	USA	2
SiGe	Canada	2
SII	Japan	2
Trident	USA	2
TriQuint	USA	2
VIA	Taiwan	2
Vitesse	USA	2

[Figure 4] Litigation K-Core



Coreness Values

3 2 1

[Table 5] Companies with the Highest Coreness Values in the Litigation Network

Company Name	Country	Coreness Values
Agere	USA	3
Analog	USA	3
Atheros	USA	3
Atmel	USA	3
Broadcom	USA	3
Cypress	USA	3
Elpida	Japan	3
Freescale	USA	3
Fujitsu	Japan	3
Honeywell	USA	3
Hynix	Korea	3
Infineon	Germany	3
LSI	USA	3
Marvell	USA	3
Matsushita	Japan	3
MediaTek	Taiwan	3
Microchip	USA	3
Micron	USA	3
Motorola	USA	3
Nanya	Taiwan	3
National	USA	3
ONSemiconductor	USA	3
Panasonic	Japan	3
Philips	Netherlands	3
ProMOS	Taiwan	3
Rambus	USA	3
Samsung	Korea	3
SanDisk	USA	3
Spansion	USA	3
STMicroelectronics	Switzerland	3
Toshiba	Japan	3

Appendix: Country of Origin of the 231 Semiconductor Companies