California Dreaming? Cross-Cluster Embeddedness and the Systematic Non-Emergence of the 'Next Silicon Valley'

Dan Breznitz
tvb@gatech.edu

Mollie Marie Taylor
Sam Nunn School of International Affairs
mollie@gatech.edu

Abstract
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Introduction

In the last thirty years we have come to realize the importance of embeddedness to economic action. Economic embeddedness is the realization that “that the behavior and institutions to be analyzed are so constrained by ongoing social relations that to construe them as independent is a grievous misunderstanding” (Granovetter 1985). Embeddedness can refer to relationships between and across individuals, firms, industries, nonprofit organizations, and governments. The impact of embeddedness has been shown to affect all aspects of economic behavior, from pricing and evaluating mergers and acquisitions, to influencing the commercial and artistic quality of Broadway musicals, to upgrading the quality of regional wines and transforming the economic fortunes of laggard communities (Haunschild 1993; McDermott et al. 2007; Uzzi and Spiro 2005). Embedded ties can provide information benefits, allow the cooptation of sources of market constraint, provide access to critical resources, endow legitimacy and status, and shape identities (Krippner and Alvarez 2007).

One of the most consistent findings is that companies embedded within regions with favorable characteristics have a regional advantage over companies that are not (Casper 2007; Herrigel 1993; Piore and Sabel 1984; Porter 1990; Sabel 1992; Saxenian 1994; Storper 1997; Uzzi 1996; Uzzi 1999). Furthermore, local embeddedness has been shown to be the difference between regional economic success and upgrading to slow decline in both crisis and good times (McDermott 2007; McDermott et al. 2007; Safford 2009). Indeed, the growing understanding of the value of local embeddedness is one of the reasons why the creation and promotion of regional clusters of innovation has become the beacon of hope for policy makers and academics
who seek local economic growth. Nonetheless, embeddedness is not only local, all individuals and firms are part of various social networks that embed them into specific economic communities, some, or even most, of which might not be local. It is, therefore crucial that we fully understand the impacts of cross-cluster embeddedness on local economic growth. Unfortunately, there is a significant gap in the literature on exactly these issues.

In the last few decades numerous regions have boldly announced their intention to become “the next Silicon Valley” (Bresnahan and Gambardella 2004; Breznitz 2007; Lerner 2009; O'Mara 2004). Carefully following the advice of many a scholar and consultant, local policy makers have taken measures to ensure that their regions are fully endowed with all the factors that have been pointed out as the necessary ingredients in the making of a successful technology cluster, from a high-quality powerful research university, to specialized venture funding (Braunerhjelm and Feldman 2006; Bresnahan et al. 2001; Cooke 2002; O'Mara 2004; Whittington et al. 2009). However, despite these efforts, very few globally successful ICT clusters have emerged in the United States in the last three decades (Casper 2007; Lerner 2009; Stuart and Sorenson 2003).

Most economic developers and policy makers believe this sobering result is due to the inability so far to completely decipher the “genetic code” of Silicon Valley.

We disagree.

We argue that the true puzzle is not deciphering Silicon Valley, but the exact opposite—explaining the almost universal failure of the best efforts led by the finest minds to achieve much in the way of sustained success anywhere else within the United States. Consequently, we argue that if we ever want to reach regional success, we must explain why such efforts have failed, and we must unlock the secret of this systemic failure.
Why is cluster emergence so rare even though it is attempted so often?

We contend that the answer lies in the fact that clusters do not develop in isolation. Thus, while attempts to develop them are locale-specific and each cluster is analyzed as an independent unit, the truth of the matter is that they are all part of a national and international industrial system. Once we add cross-cluster interactions to our analysis the influence of cross-cluster social embeddedness of firms and entrepreneurs becomes apparent. One of the most consistent findings of economic sociology and economic geography has been that in order to be successful in new high technology industries, companies and individuals need to be embedded into a vibrant industrial community (Casper 2007; Castilla 2003; Herrigel 1993; McDermott 2007; Owen-Smith and Powell 2004; Owen-Smith and Powell 2008; Piore and Sabel 1984; Porter 1990; Sabel 1992; Saxenian 1994; Storper 1997; Whittington et al. 2009). However, being embedded into an industrial community does not necessarily mean being physically located within the same locale throughout the whole company life-cycle. As a matter of fact statistically it is easier to reach commercial success for start-ups funded outside Silicon Valley (Powell et al. 2005; Whittington et al. 2009).

However, in order to be successful, firms located in aspiring clusters need to weave themselves into the industrial communities of the more established clusters such as Silicon Valley or Boston. We argue that this long-distance embeddedness has significant negative impact on the development of a coherent industrial community at the aspiring cluster. With their limited social resources focused on what they view as critical long distance relationship with financiers, customers, peers, and key individuals at the dominant clusters, the amount of time and effort management invest into the local community is gravely reduced. Additionally, as they
become more embedded within the dominant cluster, promising firms would tend to relocate into it. The result is social fragmentation of the industry at the aspiring regions.

Furthermore, this social fragmentation is self-reinforcing. Operating in an environment where companies lack a strong local community, and already have at their disposal institutionalized patterns enabling them to get embedded within the dominant cluster new promising start-ups will look outward for their socio-business interactions from their inception. The result is a continuous replication and deepening of local social fragmentation. Consequently, the locale stays fragmented, while the dominant cluster’s social networks thrive and continue to gain in importance. The end result of this process, we argue, is a national system of few dominant clusters that are served by a large number of feeder clusters. These feeder clusters end up specializing in creating good new companies whose full economic benefits are enjoyed by the dominant clusters.

Hence, while the majority of the current theories view the growth of clusters as an independent local social evolution, we view cluster development as part and parcel of a national and international industrial system evolution. Most scholars analyze the development of a cluster by exploring the evolutions of its social networks as independent, and present local social history as having the full explanatory power.¹ We argue that while local social interaction is of the utmost importance, the common outcome—that is the inability of many aspiring clusters to coalesce as a cohesive social unit— is better explained by looking at cross-clusters interactions. By so doing we can easily understand why, once a few dominant technology clusters have

¹ For example, Sean Safford has shown how the internal history of the very different social network structures of the civil and economic leadership in Allentown, Pennsylvania, and Youngstown, Ohio explain the divergence in their future after the collapse of their steel industries (Safford 2009). In a different vein, Steve Casper explains the development of a new successful biotechnology cluster in San Diego by analyzing the rapid growth of cohesive social networks within the industry (Casper 2007). Very few theories regard even the failure of networks, let alone the failure of cohesive networks to form where expected (Schrank & Whitford 2009).
already established themselves in the United States, the expectation should be that most aspiring clusters suffer from a continuous and severely socially fragmented local technology industry.

In order to develop and substantiate our argument, the next section of the paper elaborates on the theories of industrial clusters with specific focus given to social capital, networks, and embeddedness arguments. We then develop the logic of these arguments to fit in a world with an exceedingly dominant cluster region and hypothesize as to the specific predictions these models would lead us to expect. In the third section we offer an extensive analysis of the history of Atlanta, Georgia ICT industry as an empirical observation with which to more fully flesh out our arguments and further inductively develop our theory (Alexander and Bennett 2005; Bennett and Elman 2006; Eckstein 1975; Eisenhardt 1989; Gerring 2004; King et al. 1994; Ragin and Becker 1992; Yin 1994). This analysis is conducted using multiple research methods, including several social networks techniques, archival research, interviews, and statistical data analysis.

Atlanta, Georgia is a particular rich empirical ground for such a theory framing exercise. The area is abundantly endowed with all the resources deemed necessary for cluster formation: (1) The metropolitan area has numerous universities, including two of the top U.S. research universities and is the fourth richest in research investment in the nation in absolute dollar terms; (2) It claims a large highly educated labor pool; (3) It has a wealth of new technologies and entrepreneurs; (4) Atlanta attracts the young “creative” class from across the United States, with a net inflow of 25to-34-year-olds from 44 of the 49 largest U.S. metropolitan areas (Commerce 2006); (5) In both absolute and per capita terms the city is rich in venture capital (VC) financing; (6) It has a history of several companies growing to global prominence in the respective niches; (7) Atlanta has the country’s fifth largest concentration of Fortune 500 companies. In
comparison, San Francisco holds 11th place in the ranking, and Boston does not even make it into
the top 19 (Fortune 2008). This high concentration of Fortune 500 companies ensures a strong
local sophisticated demand for technology and can anchor their ICT suppliers in the area service
as a leading customer And (8) last but not least, the local policymakers are renowned for their
sustained efforts in cluster development which includes specialized program to attract star
scientists and richly fund them, dedicated incubators, multiple mentorship and entrepreneurial
education program and well established public-private technology associations. As Margaret
O’Mara remarked in her historical analysis of technology clusters development, forty years ago
if one had to bet on the location for the emergence of the next prominent high-technology
cluster, Atlanta would top the list (O'Mara 2004).

However, despite these strong positive characteristics, Atlanta’s technology industry
growth is—at best—stagnant, as can be seen in Figure 1. As Figure 2 demonstrates, even within
the sample of new technology companies that achieved commercial success and secured
institutional VC investment, more than forty percent chose to leave Atlanta within a few years of
founding. As such Atlanta offers extremely suitable empirical ground with which to inductively
elaborate and explore our general theory.

**Figure 1: Technology as a percentage of total Georgia employment and payroll, 1998-2006**

![Chart showing technology employment and payroll percentage in Georgia from 1998 to 2006.](source: County Business Patterns (U.S. Census Bureau))
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Figure 2: Percentage of promising companies no longer in Georgia

![Graph showing percentage of promising companies no longer in Georgia over years]


Theory

Economic embeddedness is the process by which social relations shape economic action in ways that some mainstream economists overlook or mis-specify by assuming that social ties affect economic behavior only minimally (Uzzi 1999). Embeddedness creates economic value through three mechanisms: trust, fine-grained information transfer, and joint problem solving (Polanyi 2001; Uzzi 1999). Through these three mechanisms, embeddedness leads to reduced incentives for opportunism and malfeasance (Putnam 2001).

The existence of these vibrant social networks and high mobility also enables firms to react to market developments faster than competitors. Embedded networks lead to improved information flows and better collective learning and collective action. Competitive advantage requires continual learning and innovation (Asheim and Coenen 2006), and the collective learning that takes place within thriving clusters provides a substantial advantage, since innovation is territorially embedded, and inter-organizational networks facilitate collective learning (Lawson and Lorenz 1999; Lundvall 1992).

Collective action is also linked to particular social institutions. Local institutions and embeddedness can allow collective action to occur, benefiting that industry within the region and
allowing companies within it to have a competitive advantage over companies in other regions (Herrigel 1996; McDermott 2007; McDermott et al. 2009; Piore and Sabel 1984; Zeitlin and Herrigel 2000). The potential for collective learning and collective action in turn improves the situation for individuals, companies, investors, and local government (Breznitz 2005; Lawson and Lorenz 1999; Lundvall 1992; Marshall 1961; Nelson 1993). This can allow companies a quicker time-to-market and thus a tremendous advantage for startups.

Accordingly, we contend that the reason why so many aspiring technology clusters never mature past their promise is the continuous fragmentation of the locale’s industrial social structure. In order to be successful, technology companies located outside the dominant cluster must create ties outside their region, particularly within the dominant cluster region (Whittington et al. 2009). As a result with time, companies—partly intentionally and partly by chance—become more embedded in the dominant cluster region and less embedded in their own. This dynamic is self-reinforcing, as the best and brightest (seeking to maximize their chances of success) continue to tie themselves to the more successful cluster, partly to compensate for the fragmented social structure of their locale. However, in so doing they perpetuate and perhaps aggravate the situation in their own region.

Thus, if the basic assumption of most researchers on clusters who analyze them as an independent unit is that through time with the addition of more resources, individuals, firms, and organizations the local structure would become denser and a true industrial community would arise, we argue that it is specifically because clusters are a part and parcel of a national and international system that, if few dominant clusters already exist, such as Silicon Valley and Route 128 in the case of ICT, the actual dynamic would be the recreation of social fragmentation. Locally, this social fragmentation should lead to the aspiring cluster reaching a
glass ceiling in terms of growth after which further development should be stagnant. Nationally we expect such a dynamic should lead to the rise of a few dominant clusters supported to which many aspiring clusters serves as satellites or feeders.

If our line of reasoning is correct logic, what we should expect to find in an aspiring cluster is that firms and entrepreneurs actively seek to embed themselves in the dominant cluster. Thus would be done through several mechanisms, aligning themselves with the status-granting organizations and individuals of the dominant cluster either where these serve as investors, board members, key customers, or strategic collaborators.

Even without any active attempt at becoming embedded in the dominant cluster, a company located outside it may quickly find it is acquiring ties within the dominant cluster. For example, promising companies from an aspiring cluster many times find that several of their important early ties, such as Venture Capitalists and key collaborators, are located in a different region. Due to the fact that the dominant cluster (by definition) has the largest number of these entities, this region will often be that of the dominant cluster. Hence, in the case of ICT, where clear dominant clusters have been established for several decades now, our arguments would lead us to expect to find a particular pattern of continuing, or even worsening, social fragmentation in the aspiring clusters. Furthermore, we would expect to see this fragmentation occurring at all levels of the ICT industry in both small and large companies, even globally successful ones, and across all facets of meaningful social interactions, such as investors or critical customers.

In addition, on the individual level we expect to find similar patterns. The reason is that by operating or being embedded in vibrant technology cluster-embedded individuals significantly decrease their career risk by creating numerous alternate employment options
should a given startup fail or dismiss them. This dynamic leads, according to Casper, already successful technology clusters to develop what Bahrami and Evans have termed “recycling mechanisms” to help preserve the value of assets committed to failed enterprises (Bahrami and Evans 1999; Casper 2009). This helps explain why within successful clusters thriving scientists and managers would give up secure careers in established companies and university labs to work within highly risky, if potentially monetarily enriching, startups; a career move which they otherwise view as akin to spending their life savings to buy a lottery ticket.

Accordingly, we argue that ICT cluster emergence in the United States in the last four decades has been extremely rare not because no other regions have factors and resources that would encourage clusters’ emergence, but because of the national (sometimes international) socio-business dynamics of the industry.

In order to elaborate and more fully flesh out our theory as well as the mechanisms of ties and embeddedness development trajectories in aspiring clusters, the next section of the paper utilizes a multi-method approach to analyze the growth and stagnation of Atlanta’s ICT industry.

**Research Methods and Data**

We use a variety of research methods to test our hypotheses by analyzing the evolution of Atlanta’s ICT industry and its rise and stagnation over time. To determine the composition of Atlanta’s technology industry, build a dynamic history of its development path, success, limitation, company growth patterns, and its social structure we used multiple data sources. To begin, aggregate data of the technology industry in Georgia was gathered. Merging two large databases of technology companies—the D&B Million Dollar database includes mostly large companies and the Southeast Innovations database includes mostly small, new companies—

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2 The Southeast Innovations database was compiled by Innovations Publishing LLC as a list of “privately owned investment-worthy companies” located in the Southeast.
allowed us to obtain a fuller picture of the current state of the industry than using just one database. The combined dataset includes 855 companies. Additional aggregate data were obtained from the U.S. Census Bureau County Business Patterns.

We created two different samples of the overall ICT industry and one niche-specific sample, all of which are specifically biased in order to show Atlanta’s ICT industry at its best. The two overall samples, one of Atlanta’s most promising ICT companies, and one sample of its most successful ICT firms in the period 1999 to 2007 were constructed using the Atlanta Business Chronicle annual publication of a “Book of Lists.” The most promising companies list consists of the top 25 VC-raising companies by quarter. We cleaned the aggregate sample so it would contain only technology-development ICT companies analyzing the complete nine years available (1999 through 2007). The second list was compiled by using the Atlanta Business Chronicle’s “Tech 50” list, which marks the best 50 Atlanta technology companies of the year. This list covers the years 1998 through 2002, 2005, and 2008 (Deloitte & Touche LLP and Arthur Andersen LLP originally compiled these data).

As another precaution to ensure in-case validity and allow in-case comparison, we have also conducted a more focused analysis of the health information technology and emergency medical records sub-sector (HIT). This group of companies was chosen because not only has it been targeted by the state of Georgia as the next promising and emerging industry to arise within the Atlanta region, but it was also recognized as the most likely technology sub-industry to consider Atlanta one of its most dominant locales worldwide. Indeed, the industry’s leading international organization and action group – the Healthcare Information and Management Systems Society (HIMSS) – has its origins in Atlanta, and Georgia Institute of Technology, Atlanta’s premier engineering school, has invested heavily in the development of the field with
help in the recruitment of star scientists with the help of the Georgia Research Alliance. We defined the industry using the list of 103 companies used by the Enterprise Innovation Institute HIT initiative.

We opted to develop two kinds of social networks to ensure robustness as well as to check different mechanisms through which cross-cluster embeddedness leads to local social fragmentation, career affiliation and interlocks networks. A career affiliation network is one where ties between members in that network (here limited to executive team members) are created when two or more members are jointly employed in the same technology company at the same time (Uzzi and Spiro 2005). This type of network is particularly useful and essential in the technology industry where job mobility is considered to be a particularly important factor for a location’s success as a cluster in the industry (Casper 2007; Fallick et al. 2006; Saxenian 1994).

In order to construct the career affiliation networks, for both the Tech 50 and Top 25 VC Deals lists we consulted companies’ web sites, news articles, and the Internet Archive to determine the names and positions of the management team and members of the board of all the companies on these two lists. For both of these lists, we determined their board and management team in the years 2000 and 2008. Career histories were constructed for these individuals dating as far back as could be found (1980 in some cases) until the present.\(^3\) In the case of the HIT companies, similar data was collected on the complete management teams of all 103 companies in the 2009 list. As the data from which to construct the complete sample of HIT firms in Atlanta

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\(^3\) Ties between executives are created through joint employment at the same company at the same time. In this way, ties can only be created between companies when job mobility occurs. When an executive changes jobs, they maintain ties with their previous company while gaining ties with their new place of employment.

For this analysis, an assumption of the five-year decay rule was made, as has been used in previous studies of a similar nature (Casper 2007, Fleming & Frenken 2006, Uzzi & Spiro 2005). The five-year decay rule assumes that ties linking one individual to a company cease to exist five years after that individual moves to another company, unless the tie is renewed by subsequent joint employment.
circa 2000 was of significantly lower quality, we limited ourselves only to the most current, 2009, list.

Apart from career affiliation, board interlocks have been shown to be one of the most important types of connections companies have and a straightforward way to provide for the transfer of knowledge between firms (Mizruchi 1996; Mizruchi and Bunting 1981). We diagramed and analyzed board interlocks’ social networks for all samples. Lastly as our aim is to have a full map of local embeddedness, board members of Fortune 500 companies located in Georgia were also included on these diagrams to show connectivity between these large companies and the top technology companies of Georgia’s Tech 50. Again, the same two time periods were analyzed, 2000 and 2008.

Finally, to better understand the dynamics of the industry and to be able to offer a richer conceptualization of the industry development and behavior, we conducted 18 focused interviews with the founders of both public and private technology companies, heads of VC funds, state officials, and key academics.

The Rise and Stagnation of the IT Industry in Atlanta

In a similar way to many other U.S. technology industries, Atlanta’s technology industry has its roots in World War II defense contracts. In 1941, Air Force Plant #6 was built in

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4 For example Davis, in a path-breaking study regarding the networks of Fortune 500 companies, showed that the types of interlocks have a marked impact on companies’ behavior, and that the most useful outside directors are other CEOs (Davis 1996). Haunschild and Beckman have shown the influence of interlocks as a significant source of information on many critical firms decisions, not the least mergers and acquisitions (Beckman & Haunschild 2002, Haunschild 1993, Haunschild & Beckman 1998). Marquis, in his influential work on social imprinting, has also demonstrated the usefulness of board interlocks network analysis in historical tracing of local industrial dynamics (Marquis, 2003). Similarly, McDermott pointed to the importance of firms’ ties to other firms (McDermott et al. 2007).

5 We used two software packages in our social network analysis: UCINET and Pajek. These are the standards for social network analysis. For creating social network diagrams, Guess was also used. Within Guess, the Bin Pack and GEM algorithms were used to display the data.
Marietta, an Atlanta suburb. The plant trained a workforce of 28,000, helping to convince Lockheed Aircraft Company to manufacture there. It was the beginning of what became one of the nation’s leading technology manufacturing clusters. On the research side, development soon followed the manufacturing. In 1946, the Georgia Institute of Technology (Georgia Tech) expanded its graduate programs, starting the transformation that would lead it to become one of the nation’s top four graduate engineering universities by the end of the 20th century. In 1965, innovation policy was institutionalized as one of the core pillars of economic development in Georgia with the formation of the Georgia Science and Technology Commission.

Atlanta’s first globally successful technological entrepreneurs were quick to follow building on this foundation. The two most celebrated companies—around which the IT industry in metropolitan Atlanta was supposed to flourish and grow—were Scientific-Atlanta, Inc. in hardware and MSA (Management Science America) in software. These two large and central companies were formed in the 1950s and 60s and continued as key players on a national level in the technology industry through the 1990s and the 2000s.

In a classic story of the creation of technology startups, Scientific-Atlanta began as a tiny university spin-off in defense-sponsored radar-related research that grew to become a multi-billion-dollar company. Scientific-Atlanta quickly expanded its business toward building antennas to test telecommunication equipment and then to its main source of growth—satellite and cable communication. The company also became one of the main breeding grounds for new ventures, and CEO Glen Robinson became a leader of the local technology industry and an early promoter of policy initiatives, such as Georgia Tech’s incubator – the Advanced Technology Development Center (ATDC). By 2005, Scientific-Atlanta, together with Motorola, was still the largest producer of set-top boxes for cable TV, employing 6,500 people in 70 countries with $1.9
billion in sales. However, it became clear that the firm was unable to expand its market, and it encountered significant difficulties selling its equipment to telephone companies, which were fast becoming dominant players in their quest for triple-play service offering (Scientific-Atlanta 2005a; Scientific-Atlanta 2005b). Consequently, in 2006 Scientific-Atlanta was acquired by California-based Cisco Systems for $6.9 billion and became the mainstay of Cisco’s Video Technology Group (Chronicle 2008).

In 1963, the software company Management Science America, Inc. (MSA) was founded by five Georgia Tech graduates as a bespoke contract programming company. In 1971, MSA went bankrupt, and the main creditor brought in John P. Imlay as the CEO in an attempt to salvage the company. Imlay quickly focused the firm on mainframe products, and within a decade MSA was the largest software applications company in the world and listed itself on NASDAQ in 1981. However, MSA was unable to change its products and business model to fit with the ongoing transformation from mainframe to personal computing (PC) and in 1990 was acquired by Dun & Bradstreet (Chronicle 2008; Museum 2007). Nevertheless, the influence of MSA and John Imlay on the development of the technology industry in Atlanta has continued to this day. Imlay Investment, run by MSA’s former CFO Sigmund Mosley, has become Atlanta’s premier seed and angel capital fund.

In conjunction with the early success stories of the technology industry, Georgia Tech by the late 1970s became known as the nexus of new technology initiatives, and the university’s role in Atlanta’s economic development became a strong focus for city leaders. Policy initiatives to develop the local technology industry continued at an accelerated rate after the 1980s, with Atlanta developing the capacity to incubate start-ups through ATDC, local sources of VC, and a few established technology firms. In 1990, a major milestone in securing the long-term
commitment to the creation and sustainment of a local “knowledge economy” was reached with the establishment of the Georgia Research Alliance. In 1999, the Yamacraw Initiative to fast-track the building of the semiconductor industry in Atlanta commenced operations.

Atlanta enjoyed a successful early history in fostering leading international companies in both hardware and software. However, no sustained cluster seems to have developed in Atlanta. The size of the industry has not grown and, in fact has diminished; currently, there is no local entrepreneurial technology company of consequence.

**Figure 3: Technology companies in Georgia with 1,000 or more employees**

![Graph showing technology companies in Georgia with 1,000 or more employees from 1998 to 2006.](image)

Source: County Business Patterns

A brief analysis of the industry reveals the rapid decline of Atlanta’s large technology companies. As shown in Figure 3 only a few large technology companies remain in Atlanta; the number of large technology firms is steadily decreasing. There were fewer than half the number of technology companies in Georgia in 2006 than in 2000. In interviews leaders of the industry were acutely aware of the situation of the problems it creates for the continuous growth of the industry. For example, a leading investor commented that: “we have had a disaster the last few years every larger technology company in Georgia has gotten acquired.”

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6 This pattern of companies being acquired by out-of-state companies is not the only source of attrition of Atlanta’s technology companies. One example is Appcelerator. Despite all players seeming to agree that Appcelerator held a lot of promise—as well as the founders’ close ties to the community—Appcelerator was not funded by local money, but instead was funded by a Menlo Park VC. The reasons behind this differ based on who is asked: whether local money took too long to put a deal on the table, did not have enough connections to offer, or
Furthermore, this decline and stagnation of the ICT industry is even more surprising as it coincident with the biggest rise in the availability of all the factors considered desirable and necessary for a technology industry to prosper. It is therefore time to see whether analysis of the social structure of the industry and its dynamics would reveal the answers to this puzzle.

**Results**

No matter how we cut and slice the data, the sample, and the social network analysis method, the results have been the same: Atlanta’s ICT industry is extremely socially fragmented. Furthermore, as we hypothesized, promising companies tend to leave the cluster (either by re-location or via M&A) during their rapid growth stage. As suspected, with time the industry’s social fragmentation is not only not improved, but actually worsened across all dimensions of companies’ social networks.

First let us look at the question of social fragmentation. We started by analyzing the overall ICT industry network. Within this very large sample of the technology industry, ties created through interlocks are very far and between with most of the industry being isolates (Figure 4). Furthermore, the overall structure is extremely sparse and fragile. Most of the connections are singular where the movement or death of one individual would split all ties. Accordingly, our analysis of the overall industry sample revealed an industry suffering from extreme social fragmentation and very meager local embeddedness.

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local money cared far more about financials than the ideas. Appcelerator moved to Mountain View, California in 2008 because Haynie wanted every advantage possible that he believed would help Appcelerator succeed. Originally, Appcelerator planned to move only its headquarters and product development to Mountain View, and hoped to grow the Atlanta office (Haynie 2008), but in 2008 they shut down their Atlanta offices and laid off their Atlanta employees due to the poor conditions of the global economy. This was despite the fact that their company was doing quite well even though the general economy was not (Haynie 2008).
When we took the interlock network of the overall ICT network shown in Figure 4 and added to it investors (with ties to companies they invested in) and lawyers (with ties to companies they provide services to), the network stayed sparse, with very few multiple connections and density, as can be seen in Figure 5 below.

We then looked at our various sub-samples to see whether an analysis of a more select group of companies might reveal a different social dynamic. Analysis of the board interlocks of both the most promising and most successful companies showed a similar picture of local fragmentation. Even the addition of Fortune 500 companies to the sample did not change the network structure.
Figure 5: Interlocks network including investors and law firms of Atlanta’s ICT companies, 2008

Figure read: white squares: VCs, black circles: companies, gray rectangles: legal

Figure 6 shows the connectivity present through board member interlocks among and between the highly successful companies and Fortune 500 companies. Even in this sample of elite companies, it is rare for board members to sit concurrently on boards of multiple companies.

Similarly, as can be seen in Figure 7 – the same fragmentation is present within the board interlocks of the population of highly promising Atlanta companies. Even though we would expect to see a high number of board interlocks between these VC-invested companies, since venture capitalists are considered crucial local embedders, the same level of fragmentation was found.
Nonetheless, there is some truth in the argument that board membership interlocks analysis might not fully represent the most dynamic domains of cross companies social networks. Therefore, we added career affiliation networks to the analysis. Figure 8 provides the social network diagram of the career affiliation network of both the most promising and the most successful companies for the most recent year available, 2008. On these diagrams, each individual (node) is tied to all other individuals in the data set that that individual has worked with in the past, assuming the five-year decay rule.\(^7\)

\(^7\) Therefore, all executives at a particular company in a particular year are tied together. A group of executives from one company can only become tied to individuals in another company through mobility of their executives. As one executive moves from one company represented to another, it builds a bridge between the two companies for which that employee has worked. Ties between individuals can be created through companies not present on either list.
As Figure 8 clearly shows, there are few connections present between companies. The vast majority of companies shown are isolated. Of the 61 companies for which career histories of executives were available, only 27 had connections to any other companies on the list. The majority of individuals are not connected to any individuals other than those they worked with in 2008. This is an unusual occurrence in networks of this type (Casper 2007).

**Figure 8: Career affiliation network most promising and highly successful, 2008**
We next conducted the same analysis for the HIT sub-sector. As can be seen in Figure 9, only 9.6% of the executive team members of Georgia’s HIT companies were included in the largest component of the network (20 of 208) of the social analysis diagram. Only twelve HIT companies in Atlanta are connected to any other HIT companies through career mobility ties.

**Figure 9: Career affiliation network of Atlanta health information technology (HIT) companies, 2008**

This social fragmentation was observed by many of our interviewees as well in the network maps. For example, a venture capitalist who invests both in Atlanta and other markets addressed this fragmentation in an interview, stating:

“In general all of the relationships I’m setting up […] none of them are with Atlanta-based companies. […] I don’t see the law firms who are really reaching out […] and the accountants are the same way. That whole ecosystem just seems to be missing. Which I think in the Boston and California areas are critical for
getting money. […] And a lot of that infrastructure appears to be missing in Atlanta.”

What, however, leads to such severe fragmentation? To start answering this question we looked at the data to see whether they suggest specific mechanisms. As investors have been repeatedly argued as crucial in the literature as well as mentioned in our own interviews; we first looked at their role. There are a total of 814 VC investments events during this time period. Of these, 157 were Georgia venture capital firms and 657 were of VC firms outside of Georgia. In order to see if more promising companies received investments more often from VCs outside of Georgia, we charted the location of investment by the rank of the technology companies on the list. This figure represents the years 1999-2007, and as such, there are nine companies at each rank. As can be seen in Figure 10, higher ranked companies on the top VC deals list had a smaller number of investors from within Georgia. Of the 144 companies receiving venture capital investment, only six received all of their investment from funds located in Georgia.

**Figure 10: Investor locations of most promising companies by rank 1999-2007**


Georgia-based investors were present in 157 deals, California investors in 125, New York and New Jersey investors in 105, and Massachusetts investors in 101. The next most frequent investor state was Pennsylvania with 32 deals. This is a marked difference in behavior from companies located at the dominant cluster; for example, Silicon Valley companies famously do not look for VC outside the Valley (Florida and Kenney 1990; Kenney 2000). Yet technology
companies in Georgia clearly feel a need to find at least one investor outside the state. A staggering ninety six percent of the highly promising companies had at least one out-of-state investor (138 of the 144). In an interview, one individual closely involved in Atlanta’s technology industry noted the following, which provides context and helps to explain this phenomenon:

“A lot of the best companies don’t even look for money in Atlanta. They purposefully look for lead investors that are outside Atlanta for the reason that they don’t believe that the Atlanta venture community has the network necessary to bring intangibles to the party. Now they typically will allow or elect to have a local VC in the syndicate of investment but very few are being led by local VCs” (authors’ interviews).

One Georgia-based venture capitalist took this further, noting that outside VCs investing in a company can directly result in that company moving to another state:

“The Valley is particularly bad on the first round of financing. If you get somebody from the Valley to participate in it <finance round> more than likely they want you to move to the West Coast. […] Where we tend to lose companies are in that very first outside funding where, a company […] got investment from Menlo and Menlo said you’re coming to the West Coast because they want it to be closer” (authors’ interviews).

After looking at investment ties, we tried to see whether our line of reasoning, which lead us to believe that a lot of the phenomenon is explained by individual level embeddedness hold water. In order to gain a better sense of how executives of Atlanta ICT companies become tied to other regions, we gathered data of the current (as of 2010) locations of the executives of companies that had been considered promising in the year 2000. Of the 232 individuals for whom data could be found, 65 (28%) are no longer located in Georgia. The individuals most commonly moved to California (12, 5%) and New York (9, 4%). As job mobility in our sample was rather low compared to similar studies of Silicon Valley,\(^8\) such high migration of already

\(^8\) We found that for executive members of the Tech 50 and Top 25 VC Deal companies in 2008, over a period of five years (2004 to 2008) individuals changed employers on an average of 0.525 times. This translates to a rate of
successful executives out of the cluster is significant, suggesting that for many a change of job
also means leaving the Atlanta region.

Another argument deriving from our line of reasoning about cross-cluster embeddedness
impacts on the continuous fragmentation of the aspiring cluster, suggests that as companies
reached the rapid expansion phase when they have already maximized the benefits of their
locale, and also cemented key relationships (such as customers, board members, and investors)
with the dominant cluster, should be a high period for relocation away from the aspiring cluster
into the dominant one.

To see whether this mechanism is indeed at work in Atlanta we again analyzed the highly
promising firms sample. The results coincidence very well with our argumentation: within three
years of receiving their major VC investment more than 40 percent of these highly promising
companies leave Atlanta via M&A or through relocation, as shown in Figure 2. Of the 51
companies from this list that we found have left Georgia through M&A or acquisition, thirteen
are now in California, eight in New York/New Jersey, and seven in Florida. No more than three
companies went to any other location. In addition, as can be seen in Figure 11, the median age of
VC-invested companies that have left Georgia is six years, or right at the midst of the rapid
expansion phase for successful technology companies.

Figure 11: Years spent in Georgia for most promising companies that left – founding to
relocation

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0.88% per month. This is about 1/3 as often as the findings outlined in Fallick et al. for the U.S. computer industry
as a whole. Their finding was that the monthly rate of employer-to-employer job change within their sample of
individuals within the computer industry was 2.41%
The critical importance of social connections on these movements, and especially of out-of-state VCs, is widely understood in the industry and it was repeatedly commented upon by our interviewees. A prominent leader of the industry who sits on several boards and advises a few other companies went as far as to comment:

“Today I did a great service to Atlanta. I convinced a local high potential start-up to accept a local VC funding and decline one from Menlo Park. Had they taken the investment from Silicon Valley, by next year they would not have been in Atlanta, they would have moved stock, lock, and barrel to the Valley. These decisions on local versus out of state VC investments are crucial to the development of the company, do the founders become part of Atlanta, or do they pack and leave the region” (authors’ interviews).

In order to examine our argument of a self-reinforcing dynamic, we analyzed the circa 2000 career affiliation networks of the most promising and highly successful samples, as well as the board member interlocks of Fortune 500 and highly successful ICT companies. Figure 12 and Figure 8 provide social network diagrams of the career affiliation networks of the most promising and highly successful companies for 2000 and 2008, respectively. The network shows less connectivity for companies in 2008 than in 2000. The fragmentation present in connectivity of Atlanta’s technology industry has been increasing over time.

**Figure 12: Career affiliation network most promising and highly successful, 2000**
However, as we stated before, career networks might not reveal the full picture specifically if cross-cluster embeddedness is more influential on the individual than on the firm level. For that reason we also examined the 2000 circa board member interlocks including both the highly successful ICT and the Fortune 500 companies. As can be seen in Figure 13 and Figure 6—board interlocks between and among highly successful ICT and Fortune 500 companies—social fragmentation does appear to worsen between these two years. In Figure 6 (circa 2000), one can see that a cluster primarily of Fortune 500 companies (represented by white squares, and Bell South in gray) existed. Some of the highly successful ICT companies
(represented as black circles) are also connected to this cluster. However, in Figure 13 (circa 2008), these interlocks have largely disappeared.

**Figure 13: Interlocks network highly successful (black circles) and Fortune 500 companies (white squares), 2000**

![Diagram of interlocks network](image)

Note: Bell South is depicted as a grey circle because it appeared in both the Tech 50 and Fortune 500 in 2000.

As our analysis shows the reality is that as time passes, the industry’s social fragmentation has persisted and probably even worsened across several domains. Hence, Atlanta’s ICT industry is locked in a self-reinforcing-sequence that prevents it from coalescing and emerging as a coherent industrial community – a true cluster.

**Conclusion**

Embeddedness has been the focus of intense research in the last three decades, and we now know of its critical importance in socio-economic life. Much of the research has treated embeddedness as local in its formation and effects. Nonetheless, we are becoming more and more aware that with the increased globalization of economic activities, cross-cluster ties and influence are extremely important, although research on their influence is still lacking. We argue that such research is critical, and that if we do not develop a deep understanding of the economic impacts of cross-clusters embeddedness, we will be unable to solve many of the most theoretically important, and policy pressing, questions of socio/political-economy.
The question of new ICT cluster emergence has been one of the most important—yet eluding—such question in the last few decades. This paper proposes a new way of thinking about cluster (non)emergence, by arguing that we must understand the interlinked dynamics between cross-cluster and embeddedness and local social fragmentation. By so doing it brings back into the debate about cluster development two understudied factors. First is the need to bring a national level, historical and dynamic, understanding of ICT industrial development. Secondly is the fact that clusters do not develop in isolation, hence, following the footsteps of recent studies by Whittington et al, Powell, and Saxenian, among others, we argue that cross-cluster social relationships are as crucial, if not more, to the development trajectory of aspiring clusters (Powell et al. 2005; Saxenian 2006; Whittington et al. 2009). Furthermore, we argue that much of the theoretical debate about cluster emergence is based on the wrong assumption—that what is needed for us to unlock the secret is to understand the “DNA” of successful clusters. We, on the other hand, argue that the more interesting fact is to understand why so many highly endowed and dynamic regions led by the best minds armed with our best theories have failed to emerge as a successful cluster. From these vantage points we argue that the best explanation for the non-emergence of new ICT clusters is the influence that dominant clusters, once established, exert on the aspiring clusters. Consequently, while locally focused analysis will tend to see these failures and successes as independent occurrences, we offer a national-system view that sees these failures as part and parcel of a national system consisting of dominant and feeder clusters.

To elaborate on these arguments we have presented evidence from Atlanta’s ICT industry. A region richly endowed in all the factors deemed necessary by the literature coupled with a long history of innovative policy actions as well as early globally-leading companies, which nonetheless has seen its ICT industry stagnate without an emergence of a coherent cluster.
In conducting this analysis we also show the merit of combining a few social networks analysis techniques—namely career affiliation and directory lists—when trying to explain the coevolution of social dynamics and structure. This multi-networks analysis approach, aiming to look at the various mechanisms with which embeddedness impact economic outcomes, has rarely been attempted and as such this paper contributes to the well-established field of social network research. Thus, this article should be seen as a first step in multiple future research trajectories.

The main finding of this paper—that cross-cluster social interactions are as important, if not more so, for local technological entrepreneurial growth than purely local ones—is pertinent to the current economic crisis and policy formulation. If there is one lesson to be learned from our research, it is that investing in physical infrastructure, and even in research, without ensuring the local embeddedness of entrepreneurs and firms as well as the sustainability of the social structure that would enable transformation of these investments into successful entrepreneurial ventures locally, would yield only long-term disappointment. We contend, therefore, that it would behoove policy-makers to start thinking more seriously about the health of their business community and the ability of individuals and organizations to succeed in economic undertakings while staying part of it, and perhaps to concentrate less on capital investment alone.

Our findings suggest two main avenues for public policy. First, new policies which can encourage and cement local embeddedness such as facilitating information sharing, securing critical beta sites and anchor customers, collective learning, access to resources, and business community building should be adopted. Regarding the Atlanta metropolitan area specifically, it might very well be that a new set of institutions, anchored around a major organization in the community such as Georgia Tech, should be created expressly for this purpose. In particular, attention should be given to ensure that current and future large Atlanta companies (technology
or non-technology) are encouraged to maintain close connections within Atlanta’s ICT industry. On that front, personal involvement of top executives from Atlanta’s leading companies is to be especially promoted.

A second venue of action for both Atlanta and other similar clusters would be to allow and stimulate the development of a more local VC industry. Because VCs are crucial in shaping the social network of the companies in their portfolio, encouraging a more localized VC industry in the metropolitan area will be a key factor in any efforts to grow a thriving technological-entrepreneurship community. Again, this recommendation urges policy makers to look at the social structure and cross-cluster influence of the venture financing available to their entrepreneurs and not to be overly fixated by the dollar amount.

Taking both research and policy implications to mind two of the most promising domains for future research are, first, a comparative study of clusters and the interlinked influences between their social networks and industrial agents such as entrepreneurs, firms, and financiers. Recent research has opened our eyes into the critical influence cross-cluster interactions have on the development of specific locales. In order to develop this literature fully there is an urgent need for the gathering, constructing, and analysis of cross and comparative clusters’ social networks.

A second avenue for future research is to delve further into the hypothesis that cross-cluster interactions are the main cause behind clusters’ development trajectories. For us to feel comfortable in proving our own theory we hope to be able to conduct a fully comparative test consisting of several clusters dominant, aspiring, and emerging. If our assumptions are correct we should see the influence of cross-cluster interaction on many domains of ICT development such as labor market movement, social legitimization and status granting influences, and
business model diffusion. Moreover, while in this paper we focused on the influence such interactions have on the aspiring clusters, a rich ground for theory building and empirical research is looking at the influence such interactions have on the dominant clusters and their sustainability.

The emergence of technology clusters and coherent industrial communities has been one of the founding questions of economic sociology; we hope that by offering a new way in which to think about it, this article has helped us in our long endeavor to understand the genesis of economically successful socio-business communities.

References


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