

Organizational ecology, invasion biology, and the extinction and generation of organizational forms

Kenji Klein

California State University, Long Beach

ABSTRACT

This paper takes a community ecology approach to understanding the impact that global trade has on the extinction and generation of organizational forms. Ecological work that addresses spatial concerns has largely focused on how population dynamics unfold within a particular space. In doing so it has largely ignored the manner in which ecological processes unfold when populations and communities of organizations interact across geographical space. The paper argues that by addressing the interactions of organizational communities across geographic space, organizational ecology can answer questions at the core of the ecological endeavor—what accounts for the generation and extinction of organizational forms. Drawing on models of quantum speciation in evolutionary biology and invasion biology in biological ecology, this paper proposes that when organizational communities that develop in relative isolation come into contact with globalized communities, it creates conditions for the extinction of existing organizational forms under some circumstances and the generation of new organizational forms under others. The paper derives a number of propositions about what conditions are conducive to form extinction, form perpetuation, and new form generation. The argument is illustrated with examples from the experiences of Japan and China in transferring Western organizational patterns. Implications are discussed, including the tradeoff between the potential benefits of preserving unique local organizational communities as sources of valuable future organizational form innovations versus the cost of preserving inefficient local forms at the expense of short-term profit maximization.

Keywords: organizational ecology, community evolution, invasion biology, organizational forms

INTRODUCTION

Globalization drew increasing attention to the role of geography and space in organizational studies. Scholars in strategy and international business have looked at how the location of resources, both natural and man-made, shape the choices organizations make about where to locate and how to structure economic activity (Dunning, 1998; Zucker, Darby, & Brewer, 1998; Stuart & Sorenson, 2003). They also looked at the way that concentration of activity within a location or industrial cluster creates location-specific resources such as specialized labor pools and localized knowledge spillovers that both help and harm firms located there (Saxenian, 1994; Piore & Sabel, 1984; Porter, 1990; Shaver & Flyer, 2000; Hennert & Park, 1994; Frost, 2001). Network scholars, meanwhile, have traced the spatial dimensions of social networks and show how proximity and distance shape social interaction and how this in turn influences important outcomes such as knowledge creation, diffusion, and transfer (Sorenson & Stuart, 2001; Owen-Smith & Powell, 2004). Institutional scholars, too, have contributed to this discussion, showing that geographically bounded national institutions influence economic action and impact organizational prospects and outcomes through such factors as the quality of legal and political infrastructure (North, 1990; Evans & Rauch, 1999) and taken for granted patterns of authority and social organization (Biggart & Guillen, 1999; Guillen, 2001).

Despite this work on the impact of geography and space on organizations, much about the relationship between geography and the process of global integration remains unexplored. Researchers know much about how organizational processes unfold within a given geographical space and also about how organizations make choices about crossing geographic space. What is less well understood are the dynamics of organizational interactions across geographic space. Tight integration of the global economy and wide dispersal of economic activity among participants located in a wide range of locations greatly expands the degree to which previously distant organizations and communities interact. Multinational enterprises, interfirm networks, and personal relationships now bridge geographic space, national economies and national institutions. Organizational communities that once operated in relative isolation engage in contact through the intensification of global investment, production, and trade. Routines, knowledge, and organizational patterns that emerged in the context of geographically specific organizational communities are being exported to other geographic locations or challenged by routines and organizational patterns developed elsewhere and imported into the local economy.

How these community contacts play out is important for understanding the nature of global business. Such contacts transform the global economy, reshape business processes and interfirm and interpersonal relationships, and change the nature and structure of national institutions worldwide. Yet, from an organizational community perspective, there is little theory to address how these interactions unfold. This paper hopes to address that gap. Taking an ecological approach to the process of globalization, this paper explores the manner in which organizational community contact across geographic space shapes the evolution of those communities. Drawing on models of quantum speciation in evolutionary biology (Grant, 1963) and invasion biology in biological ecology (Elton, 1958; Williamson, 1996), this paper argues that organizational communities that develop in relative isolation from each other develop different levels of competitive saturation. When these communities come into contact, organizational forms from communities with high levels of competitive saturation experience communities with low levels of competitive saturation as open environmental space easily colonized by invading forms. This ease of colonization can lead either to the replication of the

invading community structure and the extinction of local organizational forms in the entered community or to the generation of a wide variety of new organizational forms. Whether the former or the latter occurs is determined by how long the conditions of low competitive saturation can be maintained, which is itself shaped by characteristics of both the invading and invaded community to be discussed below. The longer low competitive saturation is maintained, the more likely contact is to generate novel organizational forms because organizations that deviate from optimal form are less likely to face survival threats.

This paper begins with a brief review of Hannan and Freeman's (1977) population ecology followed by a discussion of Astley's (1985) critique of Hannan and Freeman's explanation for the origination of new organizational forms. Then, drawing on developments in biological ecology, it explores how ecological dynamics play out when organizational populations and communities come into contact across geographical space. The paper derives a number of proposition regarding community contacts and illustrate these propositions with a discussion of the Spanish conquest of Latin America and the experiences of Japan and China in transferring Western organizational patterns, then concludes with a discussion of possible implications regarding the tradeoff between potential benefits of preserving unique local organizational communities as sources of valuable future organizational form innovations versus the cost of preserving such communities at the expense of short-term profit maximization.

ECOLOGICAL PERSPECTIVES ON ORGANIZATIONS

One of the key questions the theory of organizational ecology attempts to address is why there are so many kinds of organizations (Hannan & Freeman, 1977; 1989). Hawley noted that human social organization developed out of the way that cooperation amplifies human action (1944; 1950). Social units such as the family, tribe, local community, and formal organizations humans from selection pressures placed on them by the natural environment (Hawley, 1944). These human social units enter into competition with each other when demand for resources exceeds supply, and over time selection eliminates weaker competitors, who drop out of direct competition for those scarce resources. Defeated competitors respond by differentiating themselves by developing specialized skills that allow them to "take up ancillary roles in which they become dependent on but noncompetitive with those who have gained command over the supply" (Hawley, 1950: 203). Over time, this competitive process leads to a variety of types of organizations, each fulfilling a differentiated function within the larger organizational community, and each matched to the specific requirements of the competitive environment.

Hannan and Freeman's population ecology (1977, 1989) built on Hawley's point that competition drives organizational differentiation and fosters community-level isomorphism with the environment but argued that organization and industry structure are subject to strong inertial forces. It is not easy for firms to adapt as environments change. Routines and standard operating procedures, physical infrastructure and specialized personnel, internal political constraints, and external legitimacy constraints all combine to produce structural inertia, making it difficult for firms to change what they do and how they compete. Therefore, environmental isomorphism was unlikely to be a result of adaptation per Hawley but rather the result of selection processes. When the characteristics of a given firm matches the demands of the competitive environment, that firm will succeed. When those characteristics do not match, the firm will fail and disappear. In this way, the array of firms in an environment becomes isomorphic to the demands placed on firms by that environment.

Hannan and Freeman's formulation spurred a large body of research elaborating the basic ecological logic. However, despite their initial interest in how firm births and deaths create differentiation and shape community structure, work in population ecology fixated on the factors that shape the patterns of firm births and deaths rather than on how those birth and death patterns shape community structure. Ecological work that did address community structure was limited to the distribution of generalists versus specialists within a community (Hannan & Freeman, 1977; Carroll, 1985; Carroll & Swaminathan, 1991), while the lion's share of ecological research focused on building paradigmatic knowledge of how number, size, age, and form of organizations in a population affect firm foundings, deaths, and rates of change (Haveman, 2000).

ECOLOGY AND THE GENERATION OF NEW ORGANIZATIONAL FORMS

This focus on firm foundings, deaths, and rates of change lead Astley (1985) to critique population ecology for its failure to address the original question Hannan and Freeman set out to answer—why there are so many types of organizations. Astley argued that population ecology's analytic strategy of examining existing organizational forms and tracing the transformation of those form through selection could not account for the emergence of entirely new organizational forms because the new forms already exist in the environment being studied when population ecology begins to look at it. Moreover, the selection processes studied in population ecology do not produce new variants of existing forms. Rather, they tend to squeeze out variety, as forms not optimally matched to environmental conditions are selected out through competition. Therefore, accounting for the generation of new organizational forms required incorporating mechanisms beyond those posited in population ecology.

Astley believed the introduction of basic technological innovation was one such mechanism (Astley, 1985). McKelvey and Aldrich (McKelvey, 1982; McKelvey & Aldrich, 1983) found that a given population tends to converge based on its use of a common technology, while populations tend to diverge from each other to the extent that they rely on different technologies. Knowledge and practices tend to circulate across organizations within a population (Mansfield, 1986), making them more similar, but tend not to move between populations grounded on different technologies (Sahal, 1981), thereby reinforcing their differences.

Astley pointed out, however, that technologies don't only stabilize and isolate specific populations. Basic technologies also stabilize and isolate entire communities of populations because several populations usually develop around a particular technology, either directly applying the technology or servicing those that do. This leads to a highly elaborated, functionally integrated organizational community with members engaging in communication and resource exchanges mostly with other community members. To the extent that resource exchange occurs within the community rather than with the environment outside of the community, community members gain autonomy from the external environment. This is important because it means populations do not move inevitably towards optimal fitness with respect to a purely external environment. Rather, fitness is defined with respect to community demands. As long as the community itself survives, organizations and populations adapted to the community will survive, while those that are not, including variations theoretically better matched to the demands of the external environment, will fail. In this way, populations become cut off from sources of environmental variation, forms are preserved despite being mismatched to the larger environment, and evolution of the form is retarded.

Open Environmental Space, Isolation, and Form Variation

To explain the generation of new forms, Astley turned to developments in biological ecology and evolutionary biology more current than those drawn on by population ecologists, particularly Eldredge and Gould's work on punctuated equilibrium (Eldredge & Gould, 1972; Gould & Eldredge, 1977), which showed that long periods of population form stability are punctuated by sudden bursts of rapid new form generation. In biology the punctuated equilibrium model overturned the gradualist model upon which population ecology was based, demonstrating that new forms did not emerge from the slow accrual of changes over time through the case by case selecting out of individual population members.

In the punctuated equilibrium model, community interdependence and resource exchange across populations combined with gene exchange within populations stabilizes those populations. New forms may appear briefly in the form of mutations but do not change the character of the population either because they are maladaptive to the community structure and don't survive or because breeding with the originating population pool dilutes the change throughout the existing population pool (Grant, 1963). This stabilizing dynamic, however, is overridden when mutation is combined with physical isolation from the originating population and the community in which it is embedded. In such circumstances, the variation is not constrained by community pressures and is not diluted by interbreeding with the originating population, and a process known as "quantum speciation" unfolds (Grant, 1963). Freed from the normal stabilizing constraints of the existing community and population, the mutation can spread and develop into new forms provided they can colonize the new location. This occurs, however, only if the new location is an open environmental space, one that has a low level of competitive saturation and is not occupied by strong existing populations (Gould & Eldredge, 1977). Low competitive saturation also encourages further speciation as new mutations and variants find they are able to survive unharassed by competitors. The new forms succeed in colonizing this space not because they are optimally adapted to it, but because they are the first of their type to enter the space, after which they become difficult to dislodge (Gould & Eldredge, 1977).

Astley argued that a similar process occurs in organizational communities when basic innovations (forms of innovation different enough from existing technologies to generate new markets and industries) are introduced. When firms outside of the originating community take up development of the new technology, they are likely to develop it in ways dramatically different from existing technologies, potentially generating completely new markets. Such new markets resemble open ecological space because their newness ensures the market has a low level of competitive saturation. This enables the new form to develop, not because they are optimally fit for that environment but because they are among the first to enter the space. Thus, the low level of competitive saturation in the new space encourages experimentation and form variation. In this way, new technologies lead to the development of new industries, new organizational forms, and new populations. Over time, they become the core of a new organizational community that develops alongside the existing community, potentially destabilizing it over time and leading to the extinction of populations within it.

Astley illustrated his point with work on the U.S. semiconductor industry by Brittain and Freeman (1980) and Braun and MacDonald (1982). The transistor was initially developed at AT&T, and early improvements took place under the auspices of other large firms such as General Electric and Raytheon. Yet, wedded as they were to vacuum tube technology, these firms failed to see the potential of transistors for radically different applications. Instead, new

firms such as Texas Instruments and Transitron, which were isolated from the communities built around earlier technology, took the lead in discovering and leveraging these new applications.

Strategy scholars found empirical support for Astley's theorizing. Tushman and Anderson (1986), for example, found that industries as varied as commercial airlines, cement production, and minicomputer manufacturing did follow a pattern of slow incremental change occasionally punctuated by the arrival of dramatic technological discontinuities in the form of new basic innovations. Moreover, these innovations were generally initiated by new entrants rather than incumbent firms, and these basic innovations created more munificent environments, supporting Astley's proposition that such innovations lead to open environmental space characterized by low competitive saturation. Finally, following the introduction of new basic innovation, interfirm sales variability increased dramatically, suggesting that basic innovations disrupt the stability of existing community structures. Similar results occurred in the copy machine industry (Henderson, 1996; Henderson & Clark, 1990) and in the disk drive industry (Christensen & Rosenbloom, 1995; Christensen & Bower, 1996).

Together this work offers support for Astley's point that extinction of old organizational forms and the emergence of new ones is better understood through a community framework that incorporates punctuated equilibrium models of evolutionary biology than through a population framework grounded in evolutionary theory developed prior to Eldredge and Gould's (1972) punctuated equilibrium model. By disrupting existing community structures and creating conditions of low relative levels of competitive saturation, technological change enables form variation to occur with less risk of selection, thereby enabling new form emergence.

GEOGRAPHY AND THE GENERATION OF NEW ORGANIZATIONAL FORMS

Despite the utility of this work on the role that technology plays in the generation of new organizational forms and populations, it is worth noting that technology as the force behind quantum speciation of organizational forms is not the closest analog for applying the punctuated equilibrium model. In biological ecology and evolutionary biology, the open environmental spaces that enable new form generation are actual physical spaces. Variant forms are able to diverge from originating forms only when they become isolated from originating forms in geographic space, and thus geographic isolation plays the key role in new population emergence (Gould & Eldredge, 1977; Grant, 1963).

Therefore, it is worthwhile to look more carefully at geographic processes in community evolution to see whether they play a role in generating new organizational forms. Research on organizations affirms the role of geography and space in creating distinct interaction patterns within a given locale. Work on industrial districts, regional clusters, and network ties all lend credence to the idea that organizational communities are geographically bounded and that organizations and populations in these clusters develop unique cluster capabilities and organizational patterns (Porter, 1990; Saxenian, 1994; Owen-Smith & Powell, 2004). A number of space-related factors contribute to the creation of locally distinct communities. Proximity in space, for example, promotes cooperation among competitors (Trapido, 2007), individuals within a community are more likely to meet and form ties when they are physically close (Powell et al., 1995; Festinger et al., 1950), and these ties facilitate information flows within the community and tend to restrict the flow of information outside of the community (Singh, 2005; Sorenson & Stuart, 2001). Community member connections to local trade associations and the local scientific community reinforce this local flow of information, as members interact with and learn from

each other (Stuart & Sorenson, 2003; Audretsch & Stephan, 1996; Saxonhouse, 1991). The quality of information exchanged, moreover, is facilitated by geographic proximity as this closeness enables more face to face interaction, allowing for the transmission of high context, uncertain knowledge and tacit information (Von Hippel, 1994).

At the level of the nation state, too, scholars have examined how nations develop and maintain distinct business systems based on different institutional and social contexts. Hall and Soskice (2001) argue that the capitalist systems in different nation states take differing approaches to solving a number of critical coordination problems for economic actors, including determining how workers get trained and educated, how wages get set, and how firms get access to finance. Institutional theorists have made similar arguments (Biggart & Guillen, 1999; Guillen, 2001), arguing that within the geographic confines of a given nation, distinct patterns of authority and coordination emerge that shape which actors are treated as legitimate players in the economy and determines the patterns of interactions that connect actors to each other. These patterns have a profound impact on the range of actions available to actors within a given nation as well as the types of organizations that are likely to appear and succeed in a given context.

Thus, organizational scholars have developed a number of frameworks for understanding that geographically separated communities develop unique community structures and organizational patterns, and that this can give rise to new organizational forms. What is less well understood is what happens when these communities interact across geographic space, a dynamic that accelerated following the globalization of markets. Organizational communities that had the luxury of operating in relative isolation are increasingly drawn into contact through the intensification of global investment, production, and trade. Routines, knowledge, and organizational patterns that emerged in the context of geographically specific organizational communities are being exported to other geographical locations, where they may or may not fit with local community structures, and local routines are being challenged by routines and organizational patterns developed elsewhere and imported into the local economy.

Work by Drori et al. (2006) has demonstrated that increased contact with the global community through expanded participation in international trade and international organizations affects the structure of national governing institutions, leading them to reflect the rationalized bureaucratic governing norms that dominate in economically developed countries. Because such community contact impacts local community structures, understanding how these community contacts play out is important for understanding the long-term impact of globalization.

An ecological framework is valuable here, especially with regards to the question that originally motivated Astley (1985)—what accounts for the emergence of new organizational forms and the extinction of existing ones. Two insights from biological ecology are particularly useful for answering this question. The first involves the point raised earlier regarding the role of isolation and open ecological space in generating form variation. The second comes from the ecological subfield of invasion biology (Williamson, 1996), and what it reveals about how biological invasions impact open ecological space. As discussed above, in punctuated equilibrium models of new form generation, new forms only appear when they have access to open ecological space in which competitive saturation is low. This is because highly competitive saturation leads to intense selection pressures that crowd out new forms not matched to the existing community. Invasion biology, however, suggests that competitive saturation is relative. A community with highly competitive saturation with respect to populations already within that community may have low competitive saturation for populations that have developed in different community contexts. The study of biological invasions illustrates why.

INVASION BIOLOGY

Biological invasion occurs when non-native species enter ecosystems outside their normal range (Williamson, 1996). In most cases, initial invasions have no lasting impact because invading species generally fail to establish themselves in the local ecosystem (Williamson, 1996). However, successful invasions appear to be accelerating as human beings become more mobile, increasing the rate of jump dispersal of non-native organisms dramatically (Elton, 1958; Williamson, 1996). These human-induced biological invasions have a particularly powerful impact on local ecosystems, often experiencing dramatic success and displacing or driving indigenous species to extinction (McKinney & Lockwood, 1999). Understanding why such invasions are successful—and why they fail—will help clarify how contact across organizational communities may play out because several features of such invasions parallel the conditions under which organizational communities come into contact. A detailed discussion of one such invasion will illustrate this point.

Consider the entry of Old-World organisms into the Americas at the beginning of the sixteenth century. European white clover arrived in South America with the Spanish and quickly established itself as an aggressive invading species. Unlike the native grasslands it displaced, the clover was well adapted to the cloven hooves of the livestock the Spanish brought from Europe. Lacking natural predators, the livestock spread rapidly through the American countryside, and with them went the clover and various Old World grasses that had evolved to survive trampling by large hooved animals which existed in large numbers in the Old World, but aside from the North American bison, not in the New (Crosby, 1986). Wherever the Spaniards and their animals tread, the clover and various Old-World grasses thrived (Crosby, 1986).

The Spaniards similarly displaced the indigenous people of the Americas, sometimes exterminating whole populations. Spanish weapons and technology were key components in the subjugation of the Americas, but the Spanish also owe much of their success to organisms that accompanied them from Europe. Old World diseases were the primary cause of the decimation of indigenous peoples and were crucial to Spanish conquest and the spread of European populations in the Americas (Crosby, 1985; Diamond, 1997). Old world plants and animals were also critical to European success. These plants and animals, and the European organizational technologies in agriculture and animal husbandry that supported them, gave the Europeans an advantage over native peoples that helped ensure European political domination and Old-World biological success. Moreover, while most biological invasions involve small numbers of organisms or seeds finding their way into a new ecological space, here wave after wave of entire ecosystems arrived from the Old World, carried by complex organizational technologies.

This case illustrates several key points about ecological invasions. First, the New World was relatively open environmental space for Old World species communities. Ecological community structures that kept local flora and fauna in balance provided an insufficient level of competitive saturation to prevent introduced organisms from aggressively establishing themselves (Crosby, 1985; Diamond, 1997). Second, a key success factor for this invasion was its community nature. The clover was one of myriad species that entered the New World, not a solitary invader. Plants, animals, and diseases of all kinds crossed the ocean, displaced native species, and made their home in the western hemisphere. They succeeded because they arrived together. Community relationships among invading species, both competitive and symbiotic, contributed to their success.

Competition between diseases and human immune response, for example, played a vital role in Old World organism success generally. Improved human immune responses for dealing with crowd pathogens were met with improved pathogenic responses for dealing with human immune responses, and so on for generations. Known as the Red Queen effect (Van Valen, 1973), an evolutionary process in which an organism must continually develop in order to maintain its fitness relative to other organisms in its environment, this dynamic meant that relative to each other, humans and crowd pathogens in the Old World were largely in balance. The relative isolation of the Americas, however, left them outside of this system. Crowd pathogens did not exist here because their development and spread in human populations required large and concentrated human populations in close contact with large animal populations over long periods of time (Wolfe, Dunavan, & Diamond, 2007). Such conditions did not exist in the Americas, and the result was low resistance to Old World diseases, wave after wave of virulent epidemics with the arrival of the Europeans, and population collapse.

The degree of mutualism that existed between Old World populations was also critical. For example, Old World grasses had evolved mechanisms for surviving trampling by cloven hooves and for spreading rapidly through dispersal of their seed after consumption by Old World animals. New World isolation from hoofed animals left New World plant species vulnerable to trampling hooves and digestion by Old World domesticates. Many Old-World animals and plants also succeeded due to their relationship to the humans who had brought them. Protected and cultivated by European farmers and ranchers, replacement stock for Old World species always existed in the few cases where New World species might get the upper hand.

Community Contact and Local Form Extinction

One implication of the application of biological invasion to an organizational context is that organizations and other social forms in isolated economies are particularly vulnerable to extinction through invasion. Isolated economies are a form of open ecological space easily colonized by forms from more aggressive organizational communities. Lacking a history of intense competition, organizations and other social forms in many rural communities and developing countries likely have a difficult time resisting the encroachment of invading forms from more competitive communities. Smaller retailers in semi-rural markets, for example, are often driven out of business when big box stores enter these markets, dramatically changing the competitive landscape (Store, 1997), and economists have modeled and demonstrated the way that FDI in developing countries can drive up costs and threaten the survival of domestic firms in developing economies (Caves, 1996; Aitken & Harrison, 1999).

Some have argued such competition is good for communities because competitive pressure eventually brings local organizations up to speed (Lawrence & Dyer, 1983; Porter, 1990). This conclusion is questionable. Red Queen co-evolutionary competition can be so extreme in one location that organizational forms in other locations lack competitive resistance and would be unable to survive the onslaught. In such cases, community contact would not result in temporary retreat by organizations in the weaker community, but invasion, permanent displacement, and even eradication, which leads to the following proposition.

Proposition 1: The more isolated an organizational community is from other, more competitive communities, the more likely contact with those communities is to result in invasion and local form extinctions.

Although isolation from competitive communities is a risk factor for invasibility, isolated community contact with other communities does not always result in successful invasion by the entering community. Spanish and subsequent European experience in the Americas can usefully be contrasted with the earlier excursion of the Norse in Greenland and Newfoundland, which failed both as colonization effort and as biological invasion (Crosby, 1985; Diamond, 1997). The Norse settlers in the New World remained largely separated from the Scandinavian heartland. Norse seafaring technology was insufficient to sustain robust contact between Old World and New. The number of settlers was always small, and plants, animals, and people from Europe arrived very rarely and only in limited numbers. There were never enough to overwhelm local organisms. The short growing season and icy fields also prevented European agriculture from supporting an expanded human population and limited the quantity and spread of Old-World plants and animals. These factors in turn limited the ability of crowd pathogens to sustain themselves in the Norse population and threaten local Inuit populations. In the end, the Norse settlement and European flora and fauna disappeared with little impact on the local environment.

This case demonstrates that isolation is itself insufficient for organizational community contact to result in successful invasion. Rather, it suggests important contingencies. Entering communities likely require sustained ongoing exchange at sufficient scale. Moreover, environmental conditions in the entered community may be sufficiently hostile to prevent entering forms from establishing themselves. For example, where capable governments are openly hostile to foreign organizations, place barriers to their entry, interfere with their activities, or favor local organizations, these foreign organizations will find it difficult to establish themselves, and invasion is unlikely as long as such hostility persists.

Proposition 2a: The greater the ability and efforts of governments of isolated communities to constrain organizations from outside communities, the less likely contact with competitive communities is to result in invasion and local form extinctions.

The contrast between the Norse and Spanish cases also suggests that invasions that overwhelm will more likely occur when the level of contact between communities is sufficiently robust to enable entry by a broad range of populations rather than by a limited group of one or two populations because mutualism among invading populations puts greater pressure on local organizational forms. The competitive edge of an invading population over a local population often depends upon its relationships to other populations in its home community. A manufacturer whose market access depends upon a sophisticated distribution system that exists in the home community but not in the newly entered community, for example, may be unable to leverage its production advantages over local producers whose knowledge, routines, and relationships are well integrated with the local distribution channels. Producers that depend upon suppliers from the home community to achieve low cost and high quality may find their organizational strengths add little competitive advantage over local firms if they are forced to rely on local suppliers to fulfill their needs. By contrast, when an entire community of organizational populations enters an isolated community, entering organizations can replicate home community competitive dynamics in the entered community. This is likely to have a much greater impact on local organizations in the entered community, leading to the following proposition.

Proposition 2b: The greater the proportion of a distant, more competitive community that enters an isolated community, the more likely the isolated community's contact with competitive entering community is to result in invasion and local form extinctions in the isolated community.

The impact of contact with more competitive communities on isolated economies is likely to be especially dramatic if attempts to integrate an isolated economy into the global economy are accompanied by large changes in institutional rules and regulatory regimes to bring them more in line with global standards. Such changes inherently bias the game against local organizations, which have developed local routines adapted to existing institutional contexts and community structures. Such local routines may provide fitness benefits within specific contexts, but they become liabilities when the environment changes (Nelson & Winter, 1982). Inertial forces make it difficult for these firms to adapt to such changes in institutional and community structure. Thus, local organizations in developing economies forced to compete in the global economy may face a triple environmental shock. They must adjust to the presence of aggressive global firms previously not part of their environment, they must do so in an institutional context that has been reshaped to favor the invading firms, and they must do so while their existing resources and routines work against them. The likely outcome of such a situation is successful invasion by global firms, high deaths rates for local organizations and organizational forms, and the reduction of form diversity at the global scale, leading to the following proposition.

Proposition 3: The more that contact of isolated organizational communities with outside competitive communities is accompanied by changes in local institutional rules and regulatory regimes that match those in competitive communities, the more likely such contact is to result in invasion and local form extinctions.

VARIATION THROUGH COMMUNITY CONTACT

Invasion and local extinction are only one possible outcome of the differences in the level of competitive saturation that may exist between distant communities brought into contact. Such community contact can also be highly generative. That organizational communities separated by geographical space may experience other communities as open environmental space with low competitive saturation can, under some circumstances, lead to the generation of new organizational forms rather than just invasion and the extinction of existing forms. This may occur when the conditions that give rise to quantum speciation—open environmental space combined with isolation from the community of origin—exist.

In the successful invasion case theorized above, invading firms from advanced economies enter previously isolated economies, but remain tightly connected to their community of origin either because they continue to exchange resources and information predominantly with home country organizations or because the invaders enter new economies together as a community with other home country organizations. Such conditions would not generate new organizational forms because the stabilizing forces that act on populations within tight community structures (shared technology and knowledge base, stable interpopulation relationships and communication patterns, etc.) prevent novelty and experimentation in the new community just as they do in the base community. These stabilizing forces would also affect new firms founded in the invaded community because interacting with an invading community with a strong shared understanding of how things are done would act as a homogenizing force on new firms. Newly founded firms that fail to conform to the invading community structure dominating the new environment would be poorly adapted to that environment and face selection pressure.

This argument, however, assumes that the new community environment has reached a level of competitive saturation similar to that in the originating community. This is because high levels of competitive saturation are necessary for selection pressures to work (Hawley, 1950;

Hannan & Freeman, 1977). Yet, it is the relatively low level of competitive saturation in the new environment that enables distant communities to succeed in establishing themselves in the first place. This suggests that a key variable in whether novel organizational forms will occur is how quickly the invaded environment moves from low to high levels of competitive saturation. If the new space is colonized by the invading community quickly, the invading community structure is merely replicated, and new organizational forms are unlikely to develop. If, however, the process of colonization is slow or incomplete, the new environment will maintain a level of competitive saturation that is low relative to organizational forms from outside that environment. Such relative environmental munificence reduces selection pressures and would enable variant forms to survive and establish themselves, provided they interact predominantly with organizations in the new environment and not those from the invading community. By interacting mostly with organizations in the new environment, variant forms isolate themselves from both the selection regimes in the invading communities and the homogenizing forces of shared knowledge systems and institutional norms.

Thus, the generation of new organizational forms through community contact will depend upon the extent to which open environmental space with low levels of competitive saturation can be maintained in the entered environment. Two conditions can contribute to extending the period of low competitive saturation. The first occurs when distant communities enter a space so large that entering communities are unable to establish dominance before competitive saturation is reached. The second occurs when factors limit the entrance of distant communities so that arriving forms develop in the host environment without dominating it.

Variation Due to Large Open Environmental Space

One way that low competitive saturation can be maintained long enough for new organizational forms to develop is if the economy being entered by the more competitive community is so large an open environmental space that entering communities are simply unable to fill the space quickly enough to achieve community closure. Because the space is large, replicating the invading community's internal structure of functional interdependencies does not allow the community to exploit all existing opportunities. Opportunities outside the entering community continue to exist and allow variant organizational forms, both indigenous and imported, to succeed in the new environment despite deviating from what would be required of them in the invading community structure. Moreover, opportunities outside the imported community structure continue to exist for all populations within the imported community, not just for the more powerful community populations that were involved with direct resource exchange with the environment in the home community. These opportunities can draw community members to alter their relationships within the imported community, loosening up community structure and enabling firms to develop new relationships with their environment with less risk to their survival than exists under the highly competitive saturation conditions of their home environment.

Taken together, these processes can encourage new form generation because organizations not matched to the structures of the imported community will be able to survive, spread and express variation outside of the imported community without facing immediate selection pressure due to the low competitive saturation in the new environment. Not bound by the community structure, knowledge base, and institutional norms that stabilized organizational forms in the imported community, these organizations will develop as members of a new

community that includes not only organizations expressing the imported organizational form, but also organizations representing a variety of co-evolving local forms. This process is variation inducing to the extent that the imported organizational form must adjust to a dramatically different community context and to the extent that the relatively low level of competitive saturation allows the form to survive despite the costs and risks of making such adjustment.

The impact of large open environmental space on organizational form variation can be seen in China's integration into the global economy. As communities of western and Japanese firms entered the China market, they brought with them organizational patterns from their home community, but over time these patterns were altered in the low competitive saturation of the very large Chinese market. Ge (2005) and Ge and Fujimoto (2004), for example, documented innovations in the organization of production in the Chinese motorcycle industry. Initially, leading Japanese motorcycle manufacturers partnered with state-sponsored Chinese firms and succeeded in building a robust motorcycle industry, rivaling Japan in production capacity. These manufacturers replicated the structure of Japan's highly successful product design and production process, in which the lead manufacturer controlled the design process and dictated specifications to suppliers in order to ensure low cost, good quality, and smooth integration of components. A number of Chinese firms not connected with the Japanese manufacturers entered the market and initially replicated the Japanese model. Tapping into the large unmet demand for motorcycles and the availability of large numbers of component suppliers not locked into existing relationships, however, these firms soon introduced variations into the motorcycle design and production system that changed the structure of the Chinese motorcycle industry. Rather than dictating exact component specifications, as done in Japan, the Chinese firms introduced a modularized design and production system, in which they defined only performance and integration specifications for suppliers, then coordinated an iterative design process in which component suppliers worked together to drive down the cost of the overall product.

Wang (2008) documents a similar pattern of development in the Chinese automobile industry. Initially copying Japanese production systems that involved coordination of suppliers for tight integration of non-modular components, Chinese automobile makers soon altered their production systems to incorporate more modularized design principles and open production networks that enabled them to leverage China's large supplier base to drive down costs. Wang notes the prevalence of this mode of production in a variety of Chinese industries and suggests that it may be a uniquely Chinese organizational form that has developed in the face of global competition in order to take advantage of the unique structure of China's production base with its large number of small and medium producers while helping overcome its technological weakness as a late-developing economy. The discussion suggests the following proposition.

Proposition 4: The larger the isolated community that organizational forms from competitive communities enter, the more new-organizational forms will emerge in the previously isolated community.

Variation Due to Limited Entry

The second way low competitive saturation can persist long enough for new forms to develop is if conditions allow some organizations and organizational forms from more competitive communities to enter the less competitive community but limit the number of entrants or restrict entrants to only specific populations from the more competitive community. This can encourage new form generation because the allowed organizations will experience the

new environment as relatively open environmental space and be able to spread and express variation without facing immediate selection pressure. At the same time, because they will be operating in an environment that does not include other members of their home organizational community, they will not be bound by the community structure, knowledge base, and institutional norms that stabilized their form in the home community. Instead, a new community structure would emerge that situates the imported organizational form within a community of local forms. This process would be variation inducing to the extent that the imported organizational form must adjust to a dramatically different community context and to the extent that the relatively low level of competitive saturation allows the form to survive despite the costs and risks of making such adjustment.

Japan's efforts to develop a modern economy in the late nineteenth century provide an excellent example of that dynamic. During the late nineteenth century Japanese leaders transferred Western organizational patterns to Japan (Umetani, 1971; Jones, 1979; Westney, 1987). Although large numbers of these organizational patterns and organizational forms were imported into Japan at the time, many were excluded both intentionally and by happenstance. Large numbers of Western organizations did not arrive in Japan along with Western organizational patterns because the Japanese government limited overseas firms in Japan and instead brought in large number of foreign advisors to help Japanese build the institutions and organizations of a modern economy (Umetani, 1971). In the case of newspapers, for example, Westney found only one of the early metropolitan newspapers was published by a non-Japanese (Westney, 1987), but it did not survive long. The Japanese government hired Black as an adviser and then made it illegal for non-Japanese to own newspapers.

Over time, the Western newspaper as an organizational form spread in Meiji Japan, but it developed a number of unique characteristics as it adjusted to the Japanese context, including Japan's traditional publishing industry, which supplied key personnel, distribution systems, and technology (Westney, 1987). Not all of the adjustments were due to intentional efforts to limit entrance of the Western publishing community. For example, the complex nature of Japan's writing system postponed the arrival of automatic typesetting in Japan and extended reliance on hand typesetters. Forced by these limitations to use smaller and slower printing presses, Japan's dailies introduced much shorter papers than their Western counterparts and developed a unique system of publishing complimentary and distinct morning and evening editions and a heavy reliance on supplements and special features, a pattern that continues to this day (Westney, 1987).

Limited entrance of outside communities had a similar effect in Japanese manufacturing. For example, the Japanese imported the Western factory model but avoided an influx of foreign competitors. Although establishing a local textile industry required importing large quantities of Western textile machinery, this was done in a way that limited the Japanese textile community's exposure to the Western textile community. Here, the Bank of Japan created an arrangement with Mitsui bank to channel Japanese machinery orders to a single British manufacturer, Platt Brothers (Saxonhouse, 1991). With the arrival of this machinery and the technical advice of Platt Brothers' engineers, the Western factory system arrived in Japan, where it faced a relatively low level of competitive saturation. It succeeded because of its productive advantage over Japan's traditional weaving industry, but as it spread in Japan it changed forms, integrating with the traditional weaving industry and incorporating many of its elements, such as autonomous households working through cooperatives rather than a factory system, rather than replacing it (Shimatsu, 2004; Dore, 1986). In the process, new organizational forms emerged, including Japan's distinct form of network-based relational contracting.

In this way, contact between Japan's isolated economic community and that of the more globally integrated West helped foster the growth of new organizational forms. The greater competitive efficiency of Western forms of economic organization compared to the isolated Japanese forms meant that these forms could succeed in the Japanese context even when they strayed from the form that was most fit in their home community. Because entrance by Western organizations was limited, the home community structure was not replicated in Japan, ensuring that deviations were allowed to occur. Ultimately, this resulted in organizational forms both more efficient and better adapted to the specific environmental conditions that now existed in Japan, suggesting the following proposition.

Proposition 5: When organizational forms from distant competitive communities enter isolated communities, but the number and variety of those entering forms is limited, new organizational forms are likely to emerge.

CONCLUSION

This paper has attempted to outline what a deeper consideration of space in community ecology can contribute to research on the generation and extinction of organizational forms. It argues that organizational communities separated by space develop community structures with different levels of competitive saturation, and that when these communities come into contact, community structures and populations within these communities are transformed. Specifically, this paper draws on models of quantum speciation in evolutionary biology (Grant, 1963) and invasion biology (Elton, 1958; Williamson, 1996) to argue that organizational forms from communities with high levels of competitive saturation experience communities with low levels of saturation as open environmental space that are easily colonized. This ease of colonization can lead to the replication of the invading community structure and the extinction of local organizational forms or to the generation of new organizational forms. When characteristics of the entering and entered community slow entry of forms from the community with higher levels of competitive saturation, this decreases the likelihood of extinction of local forms and replication of the invading community structure. It also extends the period in which entering forms experience the entered community as munificent, enabling the generation of novel organizational forms because organizations that deviate from optimal form are less likely to face survival threats.

The model of community interaction advanced here has a number of implications for public policy and business strategy. From the perspective of developing countries, a community contact view suggests that neoliberal prescriptions for economic development are unlikely to have the desired effects. Organizations in developing economies subject to the sudden entry of organizational forms from advanced economies are likely to fail at high rates due to the dramatic shift in competitive intensity. If this entry is accompanied by changes in the regulatory environment that match the regulatory environment of advanced economies, local firms will be particularly hard hit because their existing routines were adapted to the prior regulatory context, and structural inertia will more negatively affect local firms than entering firms, even in cases where local firms are otherwise more fit than entering firms. Finally, if policy changes enable the entry of a wide range of organizations from developing countries into the economy, local forms are particularly likely to face extinction, as the entry of the entire organizational community from abroad compounds the effects of the highly competitive intensity environment on the local community. Thus, governments of developing economies that hope to benefit from global contact would do well to allow organizational forms from advanced economies to enter their

communities, but limit entry in ways that prevent the mass extinction of local forms. Doing so will not only enable local forms to persist but will also encourage potentially valuable organizational form innovations in the relatively munificent environment of the developing economy as imported forms express variation free from community pressures from their home environments. These innovations may potentially be a valuable source of competitive advantage for firms from the developing economy in the future.

Such an approach is not only beneficial from the point of view of the entered developing economy, but also from the perspective of actors throughout the global economy. Actors around the world have an interest in encouraging the development of organizational innovations that provide value in the global marketplace regardless of where they come from. When economic policies foster economic invasions, it reduces the prospects for organizational innovations in developing economies, and everyone loses because these potential innovative organizational forms are no longer available for others to draw on and benefit from.

The community contact model also has implications for the business strategies of multinational enterprises (MNE). In the short run, MNEs from developed economies may maximize profits in developed economies by maintaining relationships with other MNE from the home community that replicate home community structures. In the long run, however, replicating such structures cuts firms off from important sources of variation that the environment in the new community enables. Thus, rather than seeking profit maximization by leveraging existing routines and capabilities as they are, MNEs can benefit from the low competitive saturation in the entered environment because it enables experimentation with new organizational forms with less risk of failure. Such experimentation may later prove to be the source of new routines and capabilities that provide long-term benefits not just in the entered economy, but everywhere that the MNE operates.

Thus, the model of community contact developed in this paper suggests that the distinct organizational forms and community structures that exist in different contexts are themselves potentially valuable resources from the perspective of global economic development. The view developed here is consistent with the arguments offered by Guillen (2001) and Biggart and Guillen (1999). These institutionalists have argued that global convergence on a homogenous set of optimum organizational practices is unlikely to occur and that individual nations will continue to have distinct patterns of organization based on their different histories and institutional contexts. They also argue that governments and the organizations of individual nations would do well not to adopt supposedly universal best practices and institutional arrangement. Rather, these nations and organizations will be better served by understanding their distinct array of resources and capabilities and leveraging this understanding to develop policies and organizational practices best suited to those resources and capabilities. A community contact view of globalization is consistent with this perspective. However, it extends this argument in an important way. Biggart and Guillen have argued that differences in social organization are not only constraints on development, they are also the potential source of unique competitive advantage for societies that possess these unique characteristics. From an ecological point of view, however, these differences are more than that. Unique forms of social organization do not only belong to the societies that currently express those organizational forms. Rather, they are a potential resource for the entire human community. Just as the biodiversity of the Amazonian rain forest offers potential benefits to all of humanity, so too with organizational form diversity. As long as these diverse forms continue to exist, they provide a key source of organizational form variation that can help generate useful novel organizational forms well into the future.

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