

# Conceptualizing Integrative Trade: The Global Value Chains Framework

Timothy J. Sturgeon\*

---

## Introduction

The global economy has entered a new phase of deeper, more immediate integration that is exposing national and local economies to the winds of global competition as never before. These winds can fill the sails of our domestic firms and industries, or blow them away. Peter Dicken (1992: 5) has argued that an earlier era of ‘internationalization,’ characterized by the simple geographic spread of economic activities across national boundaries, is giving way to an era of ‘globalization,’ which involves the *functional integration* of these internationally dispersed activities. It is this functional integration that drives our growing interest in ‘integrative trade.’

What is it that enables greater functional integration in the global economy? Two key differences with the past are rapidly increasing industrial capabilities in developing countries, capabilities that reside both in local firms and the affiliates of multinational firms, and new computer-mediated approaches to real-time integration of distant activities. These new features facilitate international trade in many intermediate goods and services that have not previously been sent across borders. As a result, opportunities have opened up for firms to engage with the

---

\* Senior Research Affiliate, Industrial Performance Center, Massachusetts Institute of Technology, and COE Research Fellow, Institute for Technology, Enterprise, and Competitiveness, Doshisha School of Management, Kyoto, Japan. This paper was prepared for the conference, Integrative Trade between Canada and the United States – Policy Implications, organized by the Centre for Trade Policy and Law, Ottawa, December 6, 2006. The views expressed are those of the author and not to be attributed to the Department of Foreign Affairs and International Trade.

global economy—as buyers, suppliers, sellers, distributors, contractors, and service providers—in ways that were impossible even a few years ago. However, recent changes have created new challenges and risks, as well as opportunities. The growth of integrative trade has served to expand the arena of competition beyond final products to the vertical segments and business functions within and across industries, raising the performance requirements for firms that may have been more insulated from global competition in the past.

The implications for policy are profound. How can workers, firms, and industries be provided with the best environment for engaging with the global economy? How can we be sure that enough wealth, employment, and innovative capacity are generated at home? These are open questions. Even if policy-makers seek no interventions in the areas of trade or industrial policy, global integration can make the process of economic adjustment more difficult because it accelerates the pace of change. Trade adjustment, education, taxation, innovation, and infrastructure are all policy areas in which we need to consider the effects of integrative trade. The problem lies in our shallow understanding of the process and of its specific effects.

In this paper I argue that global integration signals an urgent need to develop new conceptual tools. Effective policy responses require a clear, detailed, and timely view of global integration and related economic changes based on solid economic data. Good economic data also provide appropriate market signals for companies, workers, students, and educational institutions. Current economic statistics, at both the level of countries and globally, are clearly not up to the job (see Sturgeon et al., 2006). But we need more than more and better economic data. We need to restructure our thinking about mechanisms and outcomes in the global economy.

This paper is organized as follows. First, I outline five trends that are working to accelerate the pace of global integration. Then, I argue that an understanding of the core dynamics of global integration requires deep qualitative knowledge of the details of specific industries. Nevertheless, the results of such industry-specific qualitative research will remain of limited util-

ity unless they can be generalized in a way that renders the insights they provide industry-independent. As a way to begin to fill this gap, I offer the “Global Value Chains (GVC) Framework,” an industry-independent conceptual model that highlights two critical aspects of integrative trade that are not captured by current economic statistics: *power and coordination* in the global economy. After presenting the features of the GVC framework, I go on to focus in more detail on the newest and most dynamic form of GVC governance: value chain modularity.

### **Five Trends Driving the Pace of Global Integration**

Global integration has a variety of indicators. First and foremost is a boom in international trade. For example, in 1985 the value of China’s exports to the United States stood at about US\$6.5 billion, less than one percent of total U.S. imports, and trade between the two countries was roughly balanced. In 2005 the United States had a trade deficit with China of more than US\$185 billion, and China’s share of total imports had increased to more than eleven percent. Intermediate goods trade is rising faster than final goods trade, a trend that indicates that increasing specialization and value chain fragmentation are key features of global integration (Yeats, 2001; Feenstra, 1998; Hummels et al., 2001). Another indicator of deepening integration in the global economy is rising anxiety about the loss of white-collar jobs in North America and Europe, triggered in part by India’s dramatic and very recent successes in exporting software and business services (Sturgeon et al., 2006). Even in fresh food, patterns of production and trade are geographically extensive, complex, and dynamic. Fruit, vegetables, meat, and fish are grown and processed around the world and delivered daily to supermarket shelves in Europe and North America (Dolan and Humphrey, 2000, 2001).

These quick examples suggest that change in the global economy is broad-based, and is proceeding with great rapidity. What are the drivers? There are five trends that are combining with increasing trade liberalization to accelerate the pace of global integration:

1. *The “great doubling” of the global workforce.* The end of the cold war and abandonment of autarkic “import substituting” development policies in places like India, Russia, and China have quite suddenly increased the size of the global workforce from approximately 1.5 billion to 2.9 billion (Freeman, 2005). If the energy and talent of these workers can indeed be effectively tapped (see below), this increase could prove large and sudden enough to place downward pressure on wages in both advanced industrial economies such as the United States and Canada as well as developing places that have long been part of the global system such as Latin America and South East Asia.
2. *Lower costs and greater capacity in global communications networks.* The overbuilding of international data transmission networks during the “dot.com” boom, as well as aggressive efforts by countries such as India and China to improve their international links and domestic infrastructure, have contributed to a radical and sudden lowering of the costs of tapping the workers and industrial capabilities that reside in developing countries. This has improved access to the huge pools of low cost but adequately skilled labour that have recently become available in the global economy.
3. *The standardization, formalization, and digitization of work.* There has been broad application of information technology to a wide variety of work tasks and business processes (e.g., word processing, call routing, inventory management, factory production). Information technology facilitates both the fragmentation and relocation of work and the reintegration of those fragments once tasks are completed (Bardhan and Kroll, 2003; Berger et al, 2005). As more firms have adopted information technology it has become more standardized to facilitate system inter-operation and information sharing (Levy and Murnane, 2004). The encapsulation of work tasks into standardized modules (Baldwin and Clark, 2000) eases the movement of work because it reduces the need for exchanging tacit knowledge and the amount of training or new capital investment required. Such “modular-

ity” is now quite common in manufacturing, but advancements are proceeding with great speed in services, in part because of what has been learned in the realm of manufacturing (Gereffi et al., 2005; Berger et al., 2005).

4. *The new, global supply-base.* Standardization has also helped to create new business opportunities for ‘global supplier’ firms that pool capacity for a range of customers (see Sturgeon (2002) for examples from electronics manufacturing and Batt et al. (2005) for call centers). Some of these suppliers are located offshore (e.g., in India, Canada, and Ireland), and others have become global in scope, with facilities in both advanced and developing countries. Such global suppliers specialize in collecting work from other firms and moving it to its “optimal” location on the globe. They make it easier for medium-sized and even small firms to engage in global sourcing and to locate parts of their business offshore.
5. *The rise of the global start-up.* Because of the above four trends, it has become possible for start-up firms to set up global operations from the first day of operation (Breznitz, forthcoming). Venture capitalists, in fact, are encouraging this practice (Wilson, 2003; Mieszcowski, 2003; and Grimes, 2004). Not only does this raise the possibility that a larger share of employment creation from new firm and industry formation will occur offshore, it also raises questions about the continued innovative leadership in advanced economies, since parts of the innovation process itself are being moved to developing countries. In industries such as electronic hardware, for example, firms based in North America have been able to retain (and in some cases regain) control over the innovative trajectory of some product categories while moving high volume, labour-intensive, and price-sensitive segments of the value chain to low-cost geographical locations. The question is how sustainable this is, and if a similar pattern can or will emerge in industries that are just beginning to become globally integrated, such as services?

The pace of change has emerged as a critical factor in the recent debate over the effects of global integration on advanced economies (Bardhan and Kroll, 2003; Blinder, 2005). There are three basic positions regarding how deepening integrative trade will affect developed economies such as the United States and Canada. These are spelled out in very rough terms as follows: (1) Specialization and innovative leadership will continue to make developed economies rich, so no policy interventions will be required (Bhagwati, 2004). (2) Policy-makers only need to worry if developed economies hive off parts of industries in which they have comparative advantages, but these negative effects will likely be small, so all that policy should aim to do is to compensate losers (Samuelson, 2004). (3) It is entirely possible for developed economies to lose comparative advantages over time, so policy-makers should take steps in some instances to assist existing industries and bolster innovative capabilities (Gomory and Baumol, 2000).

All of these positions suggest that time is required for successful adjustment to global integration. Innovation and new market creation take time to occur, compensating losers is only possible if there are not too many coming on stream too quickly, and the erosion of established comparative advantages might be staunched through policy interventions as long as it happens gradually. If change occurs with extreme rapidity, it will be difficult to innovate fast enough, to compensate the flood of losers quickly enough, or to craft and implement effective policy measures in time to make a difference.

The debate over the newest feature of global integration, services offshoring, is a case in point. Dossani and Kenney (2004; 32) argue that, in the realm of services, low capital intensity and the purely electronic form in which many services can be delivered will drive global integration faster than has been the case in manufacturing. And because service occupations are widely distributed throughout the economy, the negative effects of services offshoring could be more broadly based than has been the case with the offshoring of manufacturing work (Bardhan and Kroll, 2003). It may be that the flow of work offshore will be sufficiently large and rapid to make adjustment extremely difficult. In

this view, it is not that the theory of comparative advantage is wrong, but "...sometimes quantitative change is so large that it brings about qualitative change" (Blinder, 2005, p. 2).

### **The Importance of Qualitative Industry Case Studies**

Because the stakes are so high, we must take global integration seriously and develop ways of thinking that place the new and emergent features of the global economy in the foreground. The venerable intellectual approaches to such questions focus on the roles of comparative advantage and transnational corporations in motivating and structuring international trade and investment. While these concepts have proved to be extremely robust and are still valuable, they do not emphasize the fragmentation of the value chain or the fluid, real-time integration of capabilities in advanced economies with capabilities in places that were all but outside of the global economy only two decades ago, such as China, India, Russia, and Vietnam. In fact, they emphasize the opposite: national export specialization in final products and the extension of national advantage, via multinational affiliates, to places without the domestic capabilities to effectively compete.

We should be concerned that the assumptions embedded in theories of comparative advantage may blind us to the truer nature of global integration: that industries are becoming globally distributed and are co-evolving in elaborate and ever shifting ecosystems that make it unclear where advantage truly lies. If we are to begin with a fresh sheet of paper, where should we start? One way is to move beyond aggregate statistics to work with microeconomic data ("micro-data") collected by government agencies. Over the past decade there has been a burgeoning body of research that relies on government-collected micro-data. Some of these resources have only recently become available.

There is a host of government programs that collect detailed economic data. Some of these programs, such as the Economic Census, use surveys to collect data for publication. Typically there are more detailed micro-data that underlie the published data. The mailing lists for these surveys can also contain valuable data on the basic characteristics of individual firms and

establishments. Other programs collect data for the purpose of administering government programs such as tax collection, compliance with environmental protection laws, and the like. For this reason such data are typically referred to as “administrative data.”

One example of how administrative micro-data have been made useful for researchers is the US Census Bureau’s Business Register, which is essentially the sampling frame for the Economic Census. Data included are business name, address, a unique establishment-level identifier, industry, employment, and the identity of the firm that owns the enterprise. Data about ownership allow the enterprises in the Business Register to be aggregated to the firm level. Jarmin and Miranda (2002) have assembled the Business Register into a time-series for 1976-2002, referred to as the Longitudinal Business Database (LBD). The potential of the LBD has just begun to be tapped. For example, Bernard, Jensen, and Schott (2005b) link the LBD to the universe of import and export transactions for 1993-2000, revealing a detailed picture of the characteristics of firms that do and do not trade and offering a wealth of research possibilities on how US firms’ trading activities and domestic operations are related.

Another example from the United States is the Longitudinal Research Database (LRD), which contains data on all manufacturing establishments that were in at least one US Census of Manufactures since 1963 or one annual survey of manufactures since 1972. For 1992, the LRD incorporated data for over 378,000 manufacturing establishments (in non-census years the total is about one-sixth that amount). The LRD contains data that identify individual establishments, and a high level of detail on the manufactured inputs and products (outputs) of those establishments. Identification data include permanent plant and establishment numbers, industry codes, location, current status, and legal form of organization. Input data include total employment, number of production workers, hours worked, labour costs, materials costs, materials consumed, services and energy consumed, inventory levels, depreciable assets, and capital expenditures. Product data include receipts (value of shipments,

value added, value of re-sales); production details (5- or 7-digit SIC product codes, quantities of production, value and quantity of products shipped, value and quantity of interplant transfers, and internal consumption); and exports. Research using the LRD and other micro-data resources has explored a number of issues related to global integration, including establishment dynamics, job turnover, the effects of international trade, and productivity growth. While very valuable, these studies typically study the entire manufacturing sector and have not yet delved into the dynamics present in particular industries.

Researchers have also creatively used micro-data from more limited data sets to explore specific questions related to global integration. Harrison and McMillian (2006) and others have used the parent and foreign affiliate micro-data from the Bureau of Economic Analysis surveys on multinational firms to examine the relationship between affiliate activity and US employment. Swenson (2005) has examined the permanency of offshore assembly arrangements using extremely detailed data from United States International Trade Commission (USITC) reports. Kletzer (2002) has used micro-data from the Displaced Worker Survey to explore the experiences of workers displaced from manufacturing industries associated with increased foreign competition, and has made policy recommendations based on her findings. These studies are examples of leading-edge quantitative research on the employment effects of globalization. Because of the paucity of data collected on international trade in services, however, it is problematic to extend the methods used by these researchers to services.

But even micro-data are not enough. The rise in intermediate goods trade strongly suggests that we have moved beyond a situation where countries use domestic resources to develop and export products to the rest of the world. Countries and regions within countries are not responsible for making products and delivering services in their entirety, but have come to specialize in particular elements within the larger chain of value-added activities. As a result industrial output and export statistics provide a very partial view of where in the global economy value is created and where it is captured. Specifically, they provide very

little, if any, insight into the critical questions of how much control firms and industries in specific places exert over the activities they and others carry out in the global economy and how this control is translated into the distribution of gains among firms, countries, and communities. Because the picture of global integration provided by trade and investment data is so incomplete, the causal links to welfare indicators such as employment and wages derived from macro statistics can be weak and unconvincing.

What is required is deep knowledge of the forces driving change in specific industries, occupations, and geographic locations. Even with better quantitative information coming from analysis of micro-data, the impact of global integration on advanced economies will be extremely difficult to fully comprehend or respond to without a detailed view of how global integration is intertwined with other aspects of economic change, especially the automation and computerization of work and the prevailing characteristics of labour markets and corporate strategies in specific service industries and occupations. The best way to learn about the interaction of these complex elements of economic change is through qualitative research on the trade-offs that managers of individual firms and establishments in specific industries face and the choices they make. Ralph Gomory has referred to industry studies of this kind as “observational science.”<sup>1</sup>

Over the past 20 years, grounded, qualitative, field-based research on specific industries has led investigators to a common set of questions and concerns. As industry after industry has developed deep connections beyond local and national jurisdictions, the practitioners of such “industry studies” have gravitated toward questions about how the global-scale division of labour is evolving, what specific roles firms based in different societies play in global-scale production networks, and what the implications of these differences are for the welfare and

---

<sup>1</sup> Ralph Gomory is President of the Alfred P. Sloan Foundation. This comment was made in the course of remarks given at the Industry Studies Annual Conference in Cambridge, Massachusetts on Dec. 15, 2005.

economic performance of nations, workers, and communities, whose prospects and experiences are inherently more territorially bounded. In the 1960s through the 1980s, the multinational firm embodied the growing disjuncture between the motives of large firms and local communities. The concern was that the rise of “stateless” multinationals meant the demise of national industries and a loss of local control. But close observation shows us that even the largest firms remain rooted in their home economies in important ways even as their operations become global in scope. We are in the midst of a profound transition nonetheless. Multinational firms have arisen in many countries, resulting in a deep interpenetration of the global economy, driven by both outward and inward investment. But it is the expansion of non-equity ties, often referred to as ‘global sourcing,’ that generates the most novel and complex aspects of global integration.

Decisions about global sourcing and relocating business activities are inevitably made in the context of broader company strategies related to the development of new products, the pursuit of new customers and markets, the adoption of new technologies and production techniques, and the like. Distinguishing economic changes due to offshoring that displaces domestic employment from offshoring that does not—for example, when a firm establishes a presence to gain access to a foreign market that cannot be accessed through exports—is therefore extremely difficult to do without speaking directly with the managers making the key decisions. Even when examining the operations of a single firm, with full cooperation from management, it can be extremely difficult, if not impossible, to precisely measure the employment effects of global integration.

For example, Dossani and Kenney (2005), in their case study of Company X, an electronic equipment and services firm with approximately 30,000 employees worldwide, showed that the geographic consolidation of service-related activities in India was accompanied by simultaneous consolidation of business functions and information technology platforms (see Table 1). In the words of Rafiq Dossani:

Company X took the opportunity of preparing to outsource to India to completely re-engineer the way they did their back office work. In the process of doing this they created new job descriptions and new jobs in-house, new jobs for their local outsourcing partners, and new jobs for their offshore affiliates and partners. We tried to take a very granular view, to look at job descriptions, and follow where the work was being done, but found that this was impossible to do. So, even though we had an insider to work with and full cooperation, we were unable to actually look at job content and where that content was moved. For example, if a job consists of making an entry into a computer, and now it is made on a different platform, routed differently, supervised differently, it is not the same activity any longer.<sup>2</sup>

**Table 1. The Context for Offshoring at Company X:  
Functional, Technological, and Geographic Consolidation**

- 1) The consolidation of shared services across geographies and departments, particularly human resources, finance, engineering services and procurement, into a limited number of global hubs.
- 2) The consolidation of enterprise resource planning and customer relationship management [IT] systems into common platforms using off-the-shelf technologies and minimizing the usage of legacy applications.
- 3) The consolidation of geographical footprints.

Source: Dossani and Kenney, 2005, p. 25.

These methodological challenges should not lead us to abandon our efforts to gauge the employment effects of global integration, only to temper our confidence in estimates based on aggregate data or in the insights gained through qualitative research. Nevertheless, in specific industries and occupations, qualitative research can provide valuable insights into the real and potential job effects of global integration.

For example, Levy and Goelman (2005) use qualitative methods to show that only a tiny number of US radiology im-

---

<sup>2</sup> Author interview with Rafiq Dossani, February 2, 2005, Stanford, CA.

ages are currently read outside of the United States; they convincingly argue that it is highly unlikely that this number will increase substantially in the future. The shift from analog to digital radiology imaging has certainly made the remote analysis of radiology images technically feasible, a fact that has spurred much hand wringing in the media about radiology jobs “moving” offshore. Tight labour markets and high salaries for radiologists, in part due to a cap on federal funding for hospital residencies, also suggest high potential for the offshore interpretation of radiology images. But because there is a need, in many cases, for close consultation between radiologist and doctors, almost all radiology images are read at or very near the site where they are taken. Moreover, the high cost of radiology imaging equipment relative to the cost of interpretation, the restriction of US malpractice insurance to doctors who have done US residencies and passed US medical board exams, the group power of US doctors to restrict competition, and Medicare reimbursement regulations all work to keep the remote interpretation of radiology images on shore.

Because of these “institutional” factors, Levy and Goelman found that virtually all of the very small number of radiology images that are read offshore are read by radiologists who completed their residency and passed their board certification in the United States. For example, a US board certified radiologist in Sydney, Australia, can work days reading images generated at night in the United States. An understanding of such industry-specific factors, and their interaction, requires deep knowledge of specific industries and occupations that can only be gained through qualitative research methods.

As these examples show, industry case studies have the potential to reveal some of the deeper dynamics, and limits, of global integration. One core finding from this research is that firms from advanced industrial countries have played a central role in driving and shaping global integration. In India, firms that provide IT services interact with clients from around the world on a daily or even hourly basis to provide them with the packages of services they need (Dossani and Kenney, 2003). In horticulture, large retailers have worked closely with exporting

companies in Africa and Central America to obtain products that meet their ever-increasing demands for variety, food safety and speedy delivery (Dolan and Humphrey, 2001). In autos, advanced country suppliers such as Magna, Bosch, Lear, and Yazaki have set up global operations to support the network of final assembly plants that automakers have established to serve local markets (Sturgeon and Florida, 1999; Sutton, 2005). In electronics, lead firms such as Alcatel, Nortel, and Hewlett Packard have outsourced production to a set of huge, globally operating contract manufacturers including Celestica, Flextronics, Hon-hai, and Solectron (Sturgeon, 2002). In consumer goods and apparel, foreign companies do not merely buy what China produces and then resell it to North American consumers—Wal-Mart alone imported \$15 billion worth of goods to North America from China in 2003—they actively shape the industrial transformation that has made the rise of China possible (Gereffi, 1994; Feenstra and Hamilton, 2006). The vast majority of exporting factories in Mainland China are run by firms from other economies such as Taiwan, Korea, Australia, Europe, Japan, and the United States; and most make products according to the detailed specifications set by non-Chinese firms such as Wal-Mart, Costco, Dell, and Nike. Clearly we need to look beyond trade and investment statistics to find out where the power in these global-scale production arrangements lie, and how these arrangements are changing.

Julia Lane of the National Science Foundation has likened the current state of qualitative industry research to the study of the natural world in the 16<sup>th</sup> and 17<sup>th</sup> centuries.<sup>3</sup> Curious researchers made detailed notes and drawings of what they could see of the vastness and variety around them, but there were few mechanisms for compiling the findings of individual researchers into larger pools of knowledge that could reveal broad patterns. Comparison of results came haphazardly with personal

---

<sup>3</sup> These remarks were made at the MIT Working Group on Services Offshoring Workshop, held in Cambridge, Massachusetts on October 28, 2005.

communication between scholars and in the few forums, such as the British Royal Society, where researchers could present and debate their results. In this way classification systems gradually came into being and some of the mechanisms at work in nature were revealed.

Similarly, industry researchers have now had several decades to present, publish, and debate their research results, and more effort is now shifting to the construction of classification systems and to a search for the mechanisms that work to create the variety observed in the field.

The findings show that global integration is expressed differently in different industries and places. The precise patterns and effects of global integration, therefore, depend in large part on the technical and business characteristics that prevail in specific industries, and upon social and institutional characteristics of the places in which the nodes of global industries are embedded. For example, some industries, or parts of industries, are easier to fragment and globalize than are others.

What is needed now is a generic theory to explain the different patterns and to predict the outcomes associated with them.

### **From Global Commodity Chains to Global Value Chains**

A pioneering step toward the development of an industry-independent, firm-level theory of global governance was taken in a chapter that Gary Gereffi wrote for the 1994 book he edited with Miguel Korzeniewicz, *Commodity Chains and Global Capitalism*, entitled 'The Organization of Buyer-driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks.' Building on the work of Hopkins and Wallerstein (1977, 1986), who highlighted the power of the state in shaping global production systems, or 'global commodity chains' (GCCs), exercised in large part in the form of tariffs and local content rules at the point where goods and investment crossed borders, Gereffi broadened the focus of the GCC framework to include the strategies and actions of firms. Gereffi's framework laid out four key structures that characterize

and shape GCCs (input-output, geographic, governance, and institutional) but one, governance, received the most attention, both from Gereffi and his immediate co-authors and from the many others that have made use of the GCC framework.<sup>4</sup>

One reason for the shift of focus to firm-level governance was the restricted ability of states to set tariffs and local content rules because of trade liberalization. However, Gereffi was one of the first scholars to argue convincingly that trade openness alone cannot explain the creation of industrial capabilities in developing countries. The best example of this is export-oriented industrialization in East Asia. It is commonly observed that the rapid growth of exports from developing countries has come with increased trade openness in the West. This is indeed a necessary condition for the export-oriented development that has been characteristic of the world's fastest growing economies, such as Taiwan, Korea, and China. But this development path has also been influenced and enabled by the competitive strategies of American, European, and Japanese firms, which established local operations, identified local firms as suppliers, transferred skills and technologies to them, invested in them, sold advanced equipment and services to them, and consistently ordered from them in a manner that pressured them to increase their industrial, technological, and logistical capabilities. As a

---

<sup>4</sup> The first two structures mentioned by Gereffi, input-output and geographic, are largely descriptive. Firms, and the larger networks and industries to which they contribute, can be described as an amalgam of value-added activities. Through simple, if painstaking, observational research, each of these activities can be located, both organizationally and geographically, yielding the first two of Gereffi's four structures. Governance and institutional structures are causal of the first two, and so require theoretical explanation. Institutional influences on the organizational and geographic structures in global chains remain to be adequately theorized, though literature from the field of political science on varieties within capitalism provide some guidance at the level of national-level institutions (e.g., Hall and Soskice, 2001). But clearly, supra-national institutions, such as the trade rules set in the context of the World Trade Organization, can have strong effects on the geographic and organizational patterns observed in global chains.

result, developing countries, especially in East Asia, were able to establish and upgrade a critical set of domestic technological and industrial capabilities with great rapidity. Liberalization has enabled the growth of international trade, but without the push from advanced economy firms seeking to tap capabilities in developing countries, the cross-border flows of goods and services would surely be more modest, in terms of both total volume and technological content, than they are today. Because firms from advanced economies have done so much to create capabilities in developing countries, they continue to control and guide many of the key industrial resources in the global economy, even those that they do not own.

Clearly, some firms exercise a greater degree control over the shape and extent of global production networks than others. The shift in focus was from the state to the actors in the chain, and their interrelationships, especially the relative power that “lead firms,” the firms that place orders in global production networks, are able to exert to influence the actions of their affiliates and trading partners. Specifically, the GCC framework as adapted by Gereffi developed a key distinction between global chains that are “driven” by two kinds of lead firms: buyers and producers. The GCC framework usefully focused attention on the powerful role that large retailers, such as Wal-Mart, and highly successful branded merchandisers, such as Nike, have come to play in the governance of global production and distribution. Although “global buyers” typically own few, if any, of their own factories, the volume of their purchasing provides them with a huge amount of clout among their suppliers, power they have wielded to specify in great detail what, how, when, where, and by whom the goods they sell are produced. Extreme market power has also allowed global buyers to extract price concessions from their main suppliers. Supplier firms have responded by locating more of their factories in low-cost locations and working hard to extract price concessions from their own, upstream suppliers.

The GCC framework contrasted such “buyer-driven” chains with “producer-driven” chains, dominated by large manufacturing firms such as General Motors and IBM. Put sim-

ply, producer-driven chains have more linkages between affiliates of multinational firms, while buyer-driven chains have more linkages between legally independent firms. Underlying this distinction is the notion that buyer-driven chains turned out relatively simple products, such as apparel, house wares, and toys. Because innovation lies more in product design and marketing rather than in manufacturing know-how, it was relatively easy for lead firms to outsource production. In the more technology- and capital-intensive items made in producer-driven chains, such as autos and complex electronics, technology and production expertise were core competencies that needed to be developed and deployed in-house, or in tightly affiliated “captive” suppliers that could be blocked from sharing them with competitors.

Since Gereffi’s seminal work was published in 1994, transnational giants have changed quite dramatically, outsourcing many activities and developing strategic alliances with competitors. In short, they have become less vertically integrated and more network-oriented. Better global standards in the realms of business processes and product characteristics, and the heavy application of information technology in areas such as design, manufacturing, service provision, supply-chain coordination, and materials management, have enabled increased outsourcing in producer-driven chains and made it possible, and more compelling, for firms to use these systems to streamline the linkages between buyers and suppliers in both producer- and buyer-driven chains. The result has been broad and rapid shifts in chain governance, where producers have become more buyer-like through outsourcing, and where the capabilities required to serve global buyers have been escalating rapidly. Today, global-scale networks of legally independent firms no longer make only simple items, but technology- and capital-intensive goods and services as well.

Because of these changes, there was a need to move beyond the GCC framework. Field research in a range of global industries revealed convergence in global value chain structure toward external networks, but not all of these industries were labour intensive, and this demanded more network types than buyer-

driven. Specifically, there are four new features in the governance of global-scale production networks that stimulated us to re-conceptualize the key variables in global chain governance:

- Improvements in information technology and industry-level standards were enabling the codification of complex information, which in turn was easing the way for network forms of organization in technology-intensive industries.
- Flexible capital equipment was enabling the pooling of technology- and capital-intensive production in the same way that labour-intensive production could be pooled, again easing the way for network forms of organization in technology-intensive industries.
- Sophisticated supply-chain management tools were pushing labour-intensive industries up the technology curve.
- Increased outsourcing by manufacturing firms, and increased involvement in product definition by retailers (private label) were blurring the distinction between buyers and producers.

So work began to develop a new theory for understanding, explaining, and predicting firm-level governance patterns in the global economy. The result was the Global Value Chains (GVC) framework, developed by a network of scholars, practitioners, policy-makers, and NGO activists over a period of several years.<sup>5</sup> The central questions we asked were: How are specific industries coordinated at a global scale? What are the key variables that contribute to these governance patterns? What patterns of global value chain governance can be expected when these variables change? It is our attempt to answer this last question that set the GVC framework apart. Instead of a static typology, we sought to develop an operational conceptual model. In other words, changing the value of the variables should yield distinct and predictable patterns of global value chain governance.

---

<sup>5</sup> See <http://www.globalvaluechains.org> for a summary of the GVC Initiative as well as a list of related researchers and publications.

To sum up, the GCC framework was extremely valuable because it shed light on the new and powerful role that retailers and branded merchandisers were playing in global production networks. But the producer/buyer-driven typology was static. It provided no mechanisms to account for shifts in barriers to network entry brought on by technological change or firm- and industry-level learning. As empirical changes forced us to take a more dynamic view of the governance patterns in global production network, two things became clear:

- 1) there was a convergence of chain governance away from the producer-driven variant toward external, non-equity networks, and
- 2) the buyer-driven type could not characterize all of the network types being observed in the field.

### **The Global Value Chains Framework**

The GVC framework was first published in an article entitled ‘The Governance of Global Value Chains’ in the journal *Review of International Political Economy* (Gereffi, Humphrey, and Sturgeon, 2005). The article sought to both account for the recent observed changes in the organization of the global economy and to build a more theoretically-grounded approach to explaining and predicting firm-level governance patterns in geographically separate economic activities. As such, we were consciously extending and refining the GCC framework.

The GVC framework is a tool kit for understanding how activities are linked across great distances in the global economy. The main object of inquiry is the nature and content of the link between value-added activities. For simplicity’s sake, we began with two kinds of firms, lead firms, or order makers, and suppliers, or order takers. Much of the literature that seeks to create governance categories by examining the linkages between buyers and sellers in the global (or local) economy identify only two options: market or hierarchy (Williamson, 1975). Firms either invest offshore directly or buy goods and services from foreign firms. A smaller body of literature has noted the prevalence of network forms of organization where there is

some form of “explicit coordination” beyond simple market transactions but which fall short of vertical integration (Powell, 1990; Adler, 2001). While the insights from this “network” literature are useful, our field research convinced us that not all networks are the same. We identified four kinds of transactional linkages between lead firms and suppliers, market, modular, relational, and captive, and summarized all manner of intra-firm linkages as hierarchical. This yields five types of linkages, which, assuming that all linkages in a given chain of activities are governed similarly, aggregate into five ideal types of GVC governance.<sup>6</sup> In essence, the GVC framework specifies three types of network governance (modular, relational, and captive) along with the two traditional modes of economic governance (markets and hierarchies). The characteristics of the five GVC governance types are summarized in Table 2.

---

<sup>6</sup> Obviously, in the real world, a given value chain will display a mix of governance forms. To complicate matters further, in-house linkages can also take a variety of forms.

## **Table 2. Five Forms of Global Value Chain Governance**

1. *Markets*. Markets are the simplest form of GVC governance. GVCs governed by markets contain firms and individuals with little interaction beyond exchanging goods and services for money. The central governance mechanism is price. The linkages between value chain activities are not very “thick” because the information that needs to be exchanged and knowledge that needs to be shared are relatively straightforward.

2. *Modular value chains*. This is the most market-like of the three network-style GVC governance patterns. Typically, suppliers in modular value chains make products or provide services to a customer's specifications. Suppliers in modular value chains tend to take full responsibility for process technology and often use generic machinery that spreads investments across a wide customer base. This keeps switching costs low and limits transaction-specific investments, even though buyer-supplier interactions can be very complex. Linkages are necessarily thicker than in simple markets because of the high volume of information flowing across the inter-firm link, but at the same time codification schemes and the internalization of coherent realms of knowledge in value chain “modules,” such as design or production, can keep interactions between value chain partners from becoming highly dense and idiosyncratic.

3. *Relational value chains*. In this network-style GVC governance pattern we see mutual dependence regulated through reputation, social and spatial proximity, family and ethnic ties, and the like. The most obvious examples of such networks are in specific communities, or “industrial districts,” but trust and reputational effects can operate in spatially dispersed networks as well. Since trust and mutual dependence in relational GVCs take a long time to build up, and since the effects of spatial and social proximity are, by definition, limited to a relatively small set of co-located firms, the costs of switching to new partners tends to be high. Dense interactions and knowledge sharing are supported by the deep understanding value chain partners have of one another, but unlike the codification schemes that enable modular networks, these “short-cuts” tend to be idiosyncratic and thus difficult and time-consuming to re-establish with new value chain partners.

4. *Captive value chains*. In this network-style GVC governance pattern, small suppliers tend to be dependent on larger, dominant buyers. Depending on a dominant lead firm raises switching costs for suppliers, which are “captive.” Such networks are frequently characterized by a high degree of monitoring and control by the lead firm. The asymmetric power relationships in captive networks force suppliers to link to their customer in ways that are specified by, and often specific to a particular customer, leading to thick, idiosyncratic linkages and high switching costs all round.

5. *Hierarchy*. This governance pattern is characterized by vertical integration (i.e., “transactions” take place inside a single firm). The dominant form of governance is managerial control.

6. The *exclusion of suppliers* from the chain. If there is low complexity and a high possibility for codification, and suppliers still do not have the capabilities to meet the requirements of buyers, then it is likely that they will be excluded from the chain. While this does not generate a global value chain type, *per se*, it is a situation that is quite common, and with requirements for suppliers increasing, perhaps increasingly likely to occur (Sturgeon and Lester, 2004).<sup>7</sup>

When would we expect each of these five governance forms to occur? From our field research, reading, and discussions, we have identified three key variables:

- 1) the *complexity* of the information exchange required to complete the transaction;
- 2) the degree to which the information can be expressed formally, or its *codifiability*; and
- 3) the level of competence in the supplier relative to the transaction.

The three variables are summarized in Table 3.

---

<sup>7</sup> It is the exclusion of developing country suppliers that has motivated us, more than any other factor, to construct this theory of global value chains. If the framework can help to make sense of value chain governance patterns, then it can be used as a basis for the development of more effective policies for industrial upgrading, especially those aimed at rectifying situations of supplier exclusion.

### **Table 3. Three Key Variables in Global Value Chain Governance**

1. *The complexity of transactions.* More complex transactions require greater interaction among actors in GVCs and thus stronger forms of governance than simple price-based markets. Thus, complex transactions will likely to be associated with one of the three network governance patterns (modular, relational, or captive) or integrated within a single firm (hierarchy).

2. *The codifiability of transactions.* In some industries schemes have been worked out to codify complex information in a manner in which data can be handed off between GVC partners with relative ease, often using advanced information technologies. If suppliers have the competence to receive and act upon such codified information, and if the codification schemes are widely known and widely used, then we would expect to see modular value chains emerge. If not, then lead firms might either keep the function in-house, leading to more vertical integration (hierarchy) or outsource it to a supplier that they tightly control and monitor (the captive network type) or have a dense, idiosyncratic relationship with suppliers (the relational governance type).

3. *The competence of suppliers.* The ability to receive and act upon complex information or instructions from lead firms requires a high degree of competence on the part of suppliers. Only then can the transfer of complex but codified information be achieved (as in modular networks) or intense interaction be worthwhile (as in relational networks). Where competent suppliers do not exist, lead firms either must internalize the function (hierarchy) or outsource it to suppliers that they tightly monitor and control (captive suppliers).

Furthermore, if one of these three variables changes, then value chain governance patterns tend to change in predictable ways. For example, if a new technology renders an established codification scheme obsolete, we would expect, all other things being equal, modular value chains to become more relational, and if competent suppliers cannot be found, then captive networks and even vertical integration would become more prevalent. Conversely, rising supplier competence would tend to push captive governance more toward the relational type and better codification schemes might prepare the ground for modular governance. The five global value chain governance types, along with the values of the three variables that determine them, are shown in Figure 1. The five types of global value chain governance are derived from ascribing binary (high or low) values to the three key variables: 1) complexity of inter-firm transactions; 2) the degree to which this complexity can be mitigated

through codification; and 3) the extent to which suppliers have the necessary capabilities to meet the buyers' requirements. Each governance type provides a different trade-off between the benefits and risks of outsourcing. As shown in the last column of Figure 1, the governance types comprise a spectrum running from low levels of explicit coordination and power asymmetry between buyers and suppliers, in the case of markets, to high levels of explicit coordination and power asymmetry between buyers and suppliers, in the case of hierarchy.

**Figure 1. The Global Value Chains Framework**

Governance Type	Key Variable			
	Complexity of transactions	Ability to codify transactions	Capabilities in the supply base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	
Modular	High	High	High	
Relational	High	Low	High	
Captive	High	High	Low	
Hierarchy	High	Low	Low	

Note: There are eight possible combinations of the three variables. Five of them generate global value chain types. The combination of low complexity of transactions and low ability to codify is unlikely to occur. This excludes two combinations. If the complexity of the transaction is low and the ability to codify is high, then low supplier capability would lead to exclusion from the value chain. While this is an important outcome, it does not generate a governance type *per se*.

The theory of GVC governance presented here combines key insights from a variety of disciplines. First, from institutional economics we accept the importance of asset specificity as a key problem in inter-firm relationships (Williamson 1985). Firms that have assets that are specific to a single trading partner create risks of hold-up that must somehow be solved. Institutional economics offers vertical integration as the solution, yielding the markets and hierarchies dichotomy. While we agree that vertical integration is one way to solve the problem of asset

specificity, literatures from several other fields convince us that there are other solutions. From the economic, sociology and economic geography literatures we learn that trust and reputation, built up over time through repeat transactions and enabled by social and spatial proximity, can offset the risks of asset specificity without vertical integration (Piore and Sabel, 1984; Granovetter, 1985; Storper, 1995). The resource view of the firm prevalent in the management literature (Penrose, 1959) convinces us that some business functions can be very difficult to acquire or to develop in-house, and so firms must continue to source them externally even if asset specificity is present. Finally, from concepts such as “open innovation,” “platform management,” and “modularity” developed in recent literature from the field of business history we learn that firms can engineer their way out of problems of asset specificity by standardizing and codifying information at specific “pinch points” in the chain of value added activities (Baldwin and Clark, 2000; Chesbrough and Kusunoki, 2001; Gawer and Cusumano, 2002).

The GVC framework is not intended to provide a grand theory of economic development, or even a full theory of the forces that shape global integration, but a transaction-, firm- and industry-centric theory of governance among the firm- and establishment-level actors in the chain. As such it cannot provide a full accounting of the governance characteristics of global value chains. It can, however, provide a bottom-up, research-driven method for accounting for observed global value chain governance characteristics as well as those that are predicted to arise *absent other factors and influences*. In this way, the GVC framework can provide researchers and policy-makers with a useful and relatively simple first-cut: if the value chain governance patterns that are predicted by the theory are not observed empirically, this provides a strong indication that forces external to the chain, such as national institutions or international trade rules, are playing a large role. In this way, the framework can provide insight into, but not a full accounting for, the observed features of global integration. While implications for policy are numerous, they depend wholly on context, and I will not attempt to fully elaborate them here. To provide just one

example, relational value chains, or more accurately the relational segments of value chains, tend to be less geographically mobile, not only because they require frequent interaction to develop and exchange tacit knowledge, but because they are often governed by the shared expectations of trust and reputation developed over long periods of time.

### **Modularity in Global Value Chains**

Of all the governance forms generated by the global value chains framework, modular value chains are the most novel because they are enabled by very recent advancements in information technology, robust industry standards, and global-scale data communications systems. They also warrant our attention because they are extremely fluid organizationally and geographically and so readily allow the production of complex goods and services to be fragmented and geographically dispersed. Finally, modular value chains, because they are based on the exchange of information according to well known standards, are very fluid relative to other forms of GVC governance that require more time to establish and re-establish efficient inter-firm linkages. This fluidity, in terms of where specific value chain activities are carried out and by whom, has contributed to the acceleration of global integration mentioned earlier. Because the rise of value chain modularity has obvious implications for policy, it is worth examining its features and precursors in some detail.

Value chain modularity is based on functional specialization, formalization of value chain linkages, and an increase in the scale and geographic reach of each horizontal segment—or ‘module’—of the value chain (Baldwin and Clark, 2000; Sturgeon, 2002; Takaishi and Fujimoto, 2001; Langlois, 2003; Prencipe et al., 2003; Gereffi et al., 2005; Sturgeon and Lee, 2005). In modular value chains distinct breaks in the sequence of activities tend to form at points where information regarding product and process specifications can be highly formalized. Activities tend to remain tightly integrated and based on tacit linkages within functionally specialized nodes of “relational” activity. Within these relational nodes tacit knowledge is cre-

ated, exchanged, and processed by establishments and workers who tend to be co-located. Between these nodes, however, linkages are eased by the application of widely agreed-upon protocols and standards. Codified linkages allow value chain modules to more easily be located at great distance.

Codification and standardization have helped to create simplified and reliable methods for transmitting detailed product and production specifications along the value chain, and for keeping track of large, complex projects with participants in diverse locations and organizations. As Coase (1937) perceived, this sort of formalization of information at the inter-firm link lowers transaction costs, allowing firms to more easily purchase inputs on the market. However, the content of this information exchange, as Coase envisioned it, consisted largely of price data. The high volume of non-price data flowing across the inter-firm link differentiates modular value chains from simple markets. Because of this complexity it is not unusual that additional engineering and coordination is required to complete a transaction. The hand-off of product and process specifications between firms need not be perfectly clean, but only relatively so for modular value chains to function.

Specifically, the key business processes that have been formalized, codified, standardized, and computerized are product design (e.g., computer aided design), production planning and inventory and logistic control (e.g., enterprise resource planning), as well as various aspects of the production process itself (e.g., assembly, test and inspection, material handling). Furthermore, because it is “platform independent,” the Internet has provided an ideal vehicle for sharing and monitoring the data generated and used by these systems. Such technologies and practices are at the core of value chain modularity. It is the formalization of information and knowledge at the inter-firm link, and the relative independence of the participating firms that gives value chain modularity its essential character: flexibility, resilience, speed, and economies of scale that accrue at the level of the industry rather than the firm (Sturgeon and Lee, 2005). Modular linkages between relational nodes of tacit activity can exist within a single firm, but only when activities are

outsourced can scale economies build up beyond the level of the firm (Langlois and Robertson, 1995).

Value chain modularity introduces risks as well as benefits for participating firms. Responsiveness may suffer as contracts are hammered out. There is potential for intellectual property and other sensitive information about product features, pricing, production forecasts, and customers to leak to competitors through shared suppliers. The ability of lead firms to innovate and design successive product generations may suffer from the atrophying of manufacturing and component knowledge, a problem that has been referred to by Chesbrough and Kusunoki (2001) as the 'modularity trap.' Reliance on standard interfaces may lead to the use of standard components, leading in turn to a loss of product distinctiveness. Shared and overlapping inventory resident in supplier organizations can lead to distortions and tracking problems that introduce waste. One unavoidable issue is that independent firms in buyer-supplier relationships often have competing interests.

In the American electronics industry, value chain modularity took shape during the late 1980s and early 1990s. Because many established firms had in-house manufacturing and components divisions, this change required the break-up of vertically integrated corporate structures and the aggregation of cast off activities in suppliers. Hewlett Packard and IBM led the way, selling most of their worldwide manufacturing infrastructure to contract manufacturers such as Solectron and Flextronics, or spinning off internal divisions as merchant contract manufacturers, as IBM did with its Toronto manufacturing complex in 1997, creating the contract manufacturer Celestica. Another source of growth in contract manufacturing was increased business from newer firms that never built up internal manufacturing divisions, such as the Internet switch company Cisco and the computer workstation and server firms Sun Microsystems and Silicon Graphics (Sturgeon, 2002).

Outsourced circuit board and final assembly of commercial electronics (products for the medical, automotive, communications, military, corporate computing markets) was mostly transferred to contract manufacturers based in North America, spe-

cifically the big five ‘electronics manufacturing services’ (EMS) firms Flextronics, Solectron, Sanmina-SCI, Jabil, and Celestica, while the assembly and even some of the design of notebook and desktop personal computers were outsourced to ‘original equipment’ and ‘original design’ (OEM and ODM) contract manufacturers based in Taiwan, such as Quanta, Compal, Inventec, Hon Hai (Foxconn), and Wistron, the contract design and manufacturing arm of Acer. By the end of the 1990s, much of the manufacturing capacity of the Taiwan-based contract manufacturers had shifted to mainland China, and the big five United States-based contract manufacturers had established a global-scale network of factories (Sturgeon and Lester, 2004). At the level of components, the 1990s was a time of rapid growth among ‘fabless’ semiconductor design firms and the semiconductor foundries (chip manufacturing plants) that served them, such as the Taiwan-based TSMC and UMC, as well as IBM (Linden and Samaya, 2003). By the end of the 1990s, modular value chains in the electronics industry were highly developed and global in scope.

An important aspect of global integration, then, is the globalization of the supply-base. As more work has been handed off to independent suppliers and service providers that are tied to lead firms through modular value chain linkages, two things have happened. First, the largest suppliers have achieved unprecedented economies of scale and scope by pooling resources across a broad customer base. As a result, some have increased the geographic scope of their business to the point where they have global-scale operations. So the multinational firm continues to be a powerful force regardless of the fragmentation and re-bundling in the value chain. Second, the existence of highly competent independent local and global suppliers has lowered the barriers to globalization for firms, including small and medium-sized firms, which have not yet shifted any activities offshore. When smaller, less competent firms begin to look outside of their own companies and perhaps even offshore for key inputs, markets are created for a broader array of functions to be outsourced, and this drives suppliers to bundle additional functions and further increase their range of competencies.

## **Conclusions**

Integrative trade is being driven by vertical fragmentation, where firms specialize in providing specific bundles of goods and services to a larger network of firms. This bundling and packaging of functions by suppliers lowers barriers to global sourcing yet further, setting in motion a cycle of increased supply-base competence and increased outsourcing and offshoring of which we clearly have not seen the end. The “co-evolutionary” view of global-scale economic integration (Sturgeon and Lee, 2005) that is embedded in the GVC framework emphasizes that the patterns of globalization that have already developed work to alter future patterns. For example, we must consider the possibility that the pace of globalization observed in manufacturing industries since the 1970s will be a poor indicator of what is likely to happen in services. The offshoring of computer hardware production began at a time when the firms in societies receiving this new business had few capabilities. International communications systems were slow, unreliable, of limited functionality, and very costly to use. Services offshoring, by contrast, is expanding with the infrastructure, firm capabilities, and business models that have been established, tested, and refined in support of global manufacturing already in place. Integrative trade in services, then, will flow down the well-trodden avenues in the global economy that were put in place largely to support global-scale goods production: across highly functional and low-cost broadband communications systems, through cross-border business relationships that have now been in place for decades, according to business models regarding outsourcing and offshoring that have been worked out in exquisite detail, and through firms with huge, well established multinational operations. Looking to the future, we cannot and should not pretend to know precisely how much or what kind of economic activity will flow across these pathways, but we cannot afford to be complacent. The long-term prospects for any country may be less certain given the vastly altered playing field on which global integration is unfolding.

The lessons for research and policy are numerous. New thinking is needed to develop useful insights into the character and implications of our increasingly globally integrated national economies. Long cherished notions and responses may need to be set aside, to be replaced or at least supplemented with new theoretical frameworks and policy initiatives. Perhaps the most pressing need is for new kinds of data to be collected, data that shed light on the important questions of power and coordination within global value chains.

## References

- Adler, Paul. 2001. "Market, Hierarchy, and Trust: The Knowledge Economy and the Future of Capitalism." *Organization Science* 12(2) (March-April), pp. 215-234.
- Baldwin, Carliss, and Kim Clark. 2000. *Design Rules*, Cambridge, MA: MIT Press.
- Bardhan, Ashok Deo; and Cynthia Kroll. 2003. "The New Wave of Outsourcing." Fisher Center for Real Estate & Urban Economics, Research Report #1103, November 2. Online at <http://repositories.cdlib.org/iber/fcreue/reports/1103>.
- Batt, Rosemary; Virginia Doellgast, and Hyunji Kwon. 2005. "A Comparison of Service Management and Employment Systems in US and Indian Call Centers." Paper prepared for the Brookings Trade Forum 2005: Offshoring White-Collar Work — The Issues and the Implications. Susan M. Collins and Lael Brainard, eds. November 10, Washington, DC. Online at <http://www.brookings.edu>.
- Berger, Suzanne, and the MIT Industrial Performance Center. 2005. *How We Compete*. New York: Doubleday.
- Bernard, Andrew B., J. Bradford Jensen and Peter K. Schott. 2005a. "Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants." *Journal of International Economics*.
- Bernard, Andrew B., J. Bradford Jensen and Peter K. Schott. 2005b. "Importers, Exporters and Multinationals: A Portrait of Firms in the U.S. that Trade Goods." NBER Working Paper 11404.
- Bhagwati, Jagdish. 2004. "The Muddles over Outsourcing." *Journal of Economic Perspectives* (Fall).
- Blinder, Alan S. 2005. "Fear of Offshoring." CEPS Working Paper No. 119, Princeton University, December.
- Breznitz, Dan. Forthcoming 2007. *Innovation and The State*. Yale University Press.
- Chesbrough, H. and K. Kusunoki. 2001. "The Modularity Trap: Innovation, Technology Phase Shifts, and the Resulting Limits of Virtual Organizations." In L. Nonaka and D. Teece,

- eds., *Managing Industrial Knowledge*. London: Sage Press, pp. 202-230.
- Coase, R. 1937. "The nature of the firm." *Economica*. 4: 386-405.
- Dicken, P. 1992. *Global Shift: The Internationalisation of Economic Activity*. London: Paul Chapman Publishing.
- Dolan, C., and J. Humphrey. 2000. "Governance and trade in fresh vegetables: the impact of UK supermarkets on the African horticulture industry." *Journal of Development Studies* 37(2): 147-176.
- Dolan, C., and J. Humphrey. 2001. "Changing governance patterns in the trade in fresh vegetables between Africa and the United Kingdom." Mimeo. Brighton: Institute of Development Studies.
- Dossani, Rafiq, and Martin Kenney. 2003. "Lift and Shift; Moving the back office to India." Work in Progress (Sept.). *Information Technologies and International Development*, 1(2) (Winter), pp. 21-37. Massachusetts Institute of Technology, Cambridge, MA.
- Dossani, Rafiq, and Martin Kenney. 2004. "The Next Wave of Globalization? Exploring the Relocation of Service Provision to India." Berkeley Roundtable on the International Economy Working Paper 156, September. University of California Berkeley, Berkeley, CA.
- Dossani, Rafiq, and Martin Kenney. 2005. "Moving Services Offshore: A Case Study of a U.S. High-Technology Firm." Report was prepared for the European Union - U.S. Department of Labor seminar *Offshoring of Services in ICT and Related Services*.
- Feenstra, Robert and Gary Hamilton. 2006. *Emergent Economies, Divergent Paths: Economic Organization and International Trade in South Korea and Taiwan*. Structural Analysis in the Social Sciences series. Marc Granovetter, ed. Cambridge, UK: Cambridge University Press.
- Feenstra, Robert. 1998. "Integration of Trade and Disintegration of Production in the Global Economy." *Journal of Economic Perspectives* 12(4), pp. 31-50.

- Freeman, Richard. 2005. "China, India and the Doubling of the Global Labor Force: Who pays the price of globalization?" *The Globalist*, June 3.
- Gawer, Annabelle and Michael Cusumano. 2002. *Platform Leadership; How Intel, Microsoft, and Cisco Drive Innovation*. Boston, Massachusetts: Harvard Business School Press.
- Gereffi, G., J. Humphrey, and T. Sturgeon. 2005. The Governance of Global Value Chains, *Review of International Political Economy* 12(1) (February), pp. 78-104.
- Gereffi, Gary. 1994. "The organization of buyer-driven global commodity chains: how U.S. retailers shape overseas production networks." In G. Gereffi and M. Korzeniewicz, eds., *Commodity Chains and Global Capitalism*. Westport: Praeger, pp. 95-122.
- Gomory, R.E., and W.J. Baumol. 2001. *Global Trade and Conflicting National Interests*. Cambridge, Mass.: MIT.
- Granovetter, Mark. 1985. "Economic Action and Social Structure: the Problem of Embeddedness." *American Journal of Sociology* 91: 481-510.
- Grimes, Anne. 2004. "Venture Firms Seek Startups that Outsource." *Wall Street Journal*. Section B1, Column 5, April 2.
- Hall, Peter and David Soskice, eds. 2001. *Varieties of Capitalism*. Oxford, UK: Oxford University Press.
- Harrison, Ann E. and Margaret S. McMillan. 2006. "Outsourcing Jobs? Multinationals and U.S. Employment.." NBER Working Paper 12372. National Bureau of Economic Research. Cambridge, MA. July. Online at <http://www.nber.org/papers/w12372>.
- Hopkins, T. and I. Wallerstein. 1977. "Patterns of Development of the Modern World-System." *Review* 1(2), 11-145.
- Hopkins, T. and I. Wallerstein. 1986. "Commodity chains in the world economy prior to 1800." *Review* 10(1), 157-170.
- Hummels, D., D. Rapoport, and K.-M Yi. 1998. "Vertical specialization and the changing nature of world trade." In Federal Reserve Bank of New York, *Economic Policy Review* 4(2), 79-99.
- Jarmin and Miranda. 2002. "The Longitudinal Business Database." Mimeo. Census Bureau. July 16. Accessed at

- [www.ces.census.gov/paper.php?paper=101647](http://www.ces.census.gov/paper.php?paper=101647), October 15, 2002.
- Kletzer, Lori. 2002. *Imports, Exports, and Jobs: What Does Trade Mean for Employment and Job Loss?* Kalamazoo, Michigan: W.E. Upjohn Institute for Employment Research.
- Langlois, R. and P. Robertson. 1995. *Firms, Markets and Economic Change*. London: Routledge.
- Langlois, Richard. 2003. "The Vanishing Hand: The Changing Dynamics of Industrial Capitalism." *Industrial and Corporate Change* 12(2), 351-385.
- Levy, Frank, and Ari Goelman. 2005. "Offshoring and Radiology." In Susan M. Collins and Lael Brainard, eds., *Offshoring White-Collar Work - Issues and Implications*. Brookings Trade Forum, Washington, DC.
- Levy, Frank, and Richard J. Murnane. 2004. *The New Division of Labor: How Computers Are Creating the Next Job Market*. Princeton, NJ: Princeton University Press.
- Linden, Greg and Deepak Somaya. 2003. "System-on-a-Chip Integration in the Semiconductor Industry: Industry Structure and Firm Strategies." *Industrial and Corporate Change* 12(3), 545-557.
- Mieszcowski, Katharine. 2003. "Moving to India Is Not a Luxury. It Is a Necessity." *Salon.Com*, December 17, 2003.
- Penrose, Edith. 1959. *The Theory of the Growth of the Firm*. Oxford: Basil Blackwell.
- Piore, M. and C. Sabel. 1984. *The Second Industrial Divide*. New York: Basic Books.
- Powell, W. 1990. "Neither Market Nor Hierarchy: Network Forms of Organization." *Research in Organizational Behavior* 12, 295-336.
- Prencipe, Andrea, Andrew Davies, and Mike Hobday, eds. 2003. *The Business of Systems Integration*. Oxford: Oxford University Press.
- Samuelson, Paul A. 2004. "Where Ricardo and Mill rebut and confirm arguments of mainstream economists against globalization." *Journal of Economic Perspectives* 18(3).
- Storper, Michael. 1995. "The Resurgence of Regional Economies, Ten Years Later: The Region as a Nexus of Untraded

- Dependencies.” *European Urban and Regional Studies* 2(3), 191-221.
- Sturgeon, T., and R. Florida. 2004. “Globalization, deverticalization, and employment in the motor vehicle industry.” In M. Kenney and B. Kogut, eds., *Creating Global Advantage*. Stanford, CA: Stanford University Press.
- Sturgeon, Timothy and Ji-Ren Lee. 2005. “Industry Co-Evolution: Electronics Contract Manufacturing in North American and Taiwan.” In S. Berger and R. Lester, eds., *Global Taiwan: Building Competitive Strengths in a New International Economy*. New York, London: M.E. Sharpe, pp. 33-75.
- Sturgeon, Timothy and Richard Lester. 2004. “The New Global Supply-base: New Challenges for Local Suppliers in East Asia.” Chapter two in *Global Production Networking and Technological Change in East Asia*. Shahid Yusuf, Anjum Altaf and Kaoru Nabeshima. eds. Oxford: Oxford University Press.
- Sturgeon, Timothy. 2002. “Modular Production Networks. A New American Model of Industrial Organization.” *Industrial and Corporate Change* 11(3), 451-496.
- Sturgeon, Timothy; Frank Levy, Clair Brown, J. Bradford Jensen; and David Weil. 2006. *MIT Industrial Performance Center Services Offshoring Working Group Final Report*. Industrial Performance Center Working Paper. Online at [http://web.mit.edu/ipc/www/IPC\\_Offshoring\\_Report.pdf](http://web.mit.edu/ipc/www/IPC_Offshoring_Report.pdf).
- Sutton, John. 2006. “The Globalization Process: Auto-Component Supply Chains in China and India.” In François Bourguignon, Boris Pleskovic, and André Sapir, eds., *Are We on Track to Achieve the Millennium Development Goals?* Annual World Bank Conference on Development Economics—Europe 2005. World Bank and Oxford University Press, pp. 185-213.
- Swenson, Deborah. 2005. “Overseas assembly and country sourcing choices.” *Journal of International Economics* 66(1), 107-130.
- Takeishi, Akira and Takahiro Fujimoto. 2001. “Modularization in the Auto Industry: Interlinked Multiple Hierarchies of

- Product, Product, and Supplier Systems.” *International Journal of Automotive Technology and Management* 1(4), 379-396.
- Williamson, Oliver E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: The Free Press.
- Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism*. New York, NY: Free Press.
- Wilson, Ron. 2003. “Venture Capitalist Explains New Rules for IC Startups.” *EETimes*, January 16.
- Yeats, A. 2001. “Just how big is global production sharing?” In S. Arndt and H. Kierzkowski, eds., *Fragmentation: New Production Patterns in the World Economy*, Oxford: Oxford University Press, pp. 108-143.