

# When do value chains go global? A theory of the spatialization of global value chains

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**Abstract** *In this article, I synthesize and extend the theoretical literature on global commodity chain (GCC) and global value chain (GVC) governance to generate a theory of the 'globalness' of value chains and the spatialization of value chain linkages. Drawing from the original GCC dichotomy of buyer/producer-driven commodity chains, I emphasize the height of entry barriers to manufacturing and supplier capability differentials across the North–South divide as determinants of the amount and geographic extent of global offshoring behaviour. Using a novel empirical approach to the measurement of global offshoring behaviour at the global industry level, the article shows that the original GCC governance scheme successfully predicts the levels, rates and timing of global production fragmentation across three networked industries. Combining the original GCC governance scheme with the more recent GVC governance types, the theory leads to predictions about the specific types of GVC linkages that might occur given the drivenness of a chain and the geographical location of lead firms and their suppliers. I conclude by drawing out the theory's implications for our understanding of the link between value chain formation and economic development in the global South and suggesting areas for future research.*

**Keywords** GLOBAL COMMODITY/VALUE CHAINS, THEORY, GARMENT INDUSTRY, TRANSPORTATION INDUSTRY, ELECTRONICS INDUSTRY, NETWORKS

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The literature on global value/commodity chains has been growing at a steady rate since the early 1990s. Launched in part by the publication of *Commodity chains and global capitalism* (Gereffi and Korczenewics 1994), the global commodity chains (GCC) and subsequent global value chains (GVC) approach to economic organization document the great extent to which economic globalization is built on a truly networked form of economic organization that is 'neither market nor hierarchy' (Bair 2008; Powell 1990). As the collection of industries, firms and regions studied has increased over time, so has the complexity of the theoretical apparatus available to understand the unfolding of this network form of organization (Bair 2009a; Gibbon et al. 2008).

One of the major concepts used to understand this dynamic unfolding is commodity/value chain governance, which refers to the process by which economic activity is coordinated across the various nodes of a value chain (Bair 2005; Gereffi 2005; Gereffi et al. 2005; Gibbon and Ponte 2005; Gibbon et al. 2008; Sturgeon 2009). The earliest theory of governance was the buyer/producer-driven dichotomy, which differentiated between commodity chains organized by lead manufacturing firms and those organized by lead non-manufacturing, or 'buying', firms (Gereffi 1994). The commodity chain construct helped explain the rise of labour-intensive manufacturing from the global South, particularly East Asia, by linking it to the organization of buyer-driven chains, in which lower entry barriers to manufacturing encouraged lead firms to offshore the bulk of the manufacturing activities (Gereffi 1999b).

Over time, the dichotomy attracted criticism because it relied on a static set of industrial characteristics, and was purportedly unable to predict change in governance over time or account for a greater amount of variation in types of coordination observed empirically (Gereffi 2001; Gereffi et al. 2005; Sturgeon 2009). To amend these deficiencies, recent theoretical accounts differentiate between three types of value chains (Gereffi et al. 2005). Depending on the configuration of three variables that characterize the transaction between a buyer and a producer of a given input – transaction complexity, transaction codifiability and the capability of the supply base in relation to the transaction – the network form of economic organization can be modular, relational or captive. While this latter approach does a much better job describing the different types of coordinating mechanisms that exist in empirical value chains, it lost some of the insights that came from differentiating between lead and subordinate firms, and from the explicitly global-spatial orientation at the centre of the buyer/producer-driven dichotomy (Gibbon and Ponte 2005).

This article contributes to the current state of theory building by synthesizing the original GCC dichotomous classification with the newer GVC categories. The synthesis integrates an important variable identified in the original GCC categories – the height of entry barriers to manufacturing – with a consideration of the supplier capability differentials that exist between the North and South. Thus, global offshoring behaviour should be most extensive in buyer-driven industries because firms are more willing to externalize manufacturing activity and the pool of capable suppliers in the global South is large. Through an analysis of three important global industries – one archetypically buyer-driven, one archetypically producer-driven, and one transitional one – I show that the rate of global production fragmentation is higher in proto-typically buyer-driven industries, and that the timing of marked increases in the rate of fragmentation coincides with reductions to entry barriers identified by industry analysts. I further suggest that some of the types of GVC governance categories that Gereffi et al. (2005) identified are more likely to be observed in the South than others. The concluding section draws out the theory's normative implications for the networked form of economic organization across the North–South divide, and suggest directions for future research.

### **Governance from commodity chains to value chains**

Early discussions of GCC governance focused on ‘issues of authority and power relationships’ among participating firms, leading to the distinction between buyer- and producer-driven commodity chains across which the lead coordinating firms occupied different positions in the production sequence (Gereffi 1994; Gibbon and Ponte 2005: 79). The dichotomy relied heavily on the characteristics of industries in which these chains occurred. Buyer-driven commodity chains arose in non-durable, labour-intensive industries, such as garments, footwear and toys (Bair 2005; Gereffi 1994). Lead firms in buyer-driven commodity chains do not engage directly in manufacturing; instead, they engage in the areas of design, marketing and retail, and ‘play the pivotal role in setting up decentralized production networks’ (Gereffi 1999b: 41).

Producer-driven commodity chains are most characteristic of capital-intensive durable goods industries, such as automobiles and aircraft (Gereffi 1994). Lead firms in these chains are the large producers, and are ‘key economic agents not only in terms of their earnings, but also in their ability to exert control over backward linkages with raw material and component suppliers, and forward linkages into distribution and retailing’ (Gereffi 1999a: 2). The major point of contrast between lead firms in the two types is that those in producer-driven chains engage in at least some of the manufacturing activity in the chain, and limit their sourcing to raw materials and intermediate goods that are supplied by several tiers of subordinate firms. Thus, these are producer-driven chains because the lead firms engage in manufacturing as well as the design, R&D and marketing activities (Gereffi 1994; Humphrey and Memedovic 2003; Rothstein 2005; Sturgeon and Florida 2004).

While the buyer/producer-driven dichotomy has been utilized extensively since its inception in 1994, it has also been critiqued along several dimensions (Bair 2009b; Gereffi et al. 2005; Sturgeon 2009; cf. Feenstra and Hamilton 2006; Gibbon and Ponte 2005; Hamilton and Gereffi 2009). First, some see the dichotomy as a static description of a given set of industries – a given industry cannot shift from producer to buyer-driven – but find that particular industries are temporally fluid and/or contain mixed governance types. A second related critique is that ‘no mechanism is provided to explain the transformation of one form into another’ (Sturgeon 2009: 123). Thus, recent renditions of chain governance begin with the explicit goal of developing an industry-neutral ‘dynamic, operational theory that [can] account for observed changes and anticipate future developments’ (Sturgeon 2009: 118). Gereffi et al. (2005) developed a governance typology (including modular, relational and captive governance) that represents different network forms occupying the analytical space between market and hierarchy. All five types are a function of different combinations of three variables characterizing the transaction between the producer and consumer of a given input – (1) transaction complexity, (2) transaction codifiability and (3) the capability of the supply base in relation to the transaction. Taking values of either high or low, there were five logical combinations of the variables as reported in Table 1.<sup>1</sup>

**Table 1: Five categories identified by Gereffi, Humphrey and Sturgeon**

Governance Type	Transaction Complexity	Transaction Codifiability	Capability of the supply base relative to the transaction
Market	Low	High	High
Modular	High	High	High
Relational	High	Low	High
Captive	High	High	Low
Hierarchy	High	Low	Low

Note: adapted from Gereffi et al. (2005: 87).

When the complexity of a transaction is low, its codifiability must be high and, when these two co-occur with high supplier capability, the authors predict market types of governance where buyers purchase standardized inputs based primarily on considerations of cost (Gereffi et al. 2005: 100 n.10). When high transaction complexity is accompanied by codifiability through the diffusion of technical standards and when the supply base is highly capable in relation to it, one would expect to observe modular value chains. The major difference between modular and market links is that the former rely on the transfer of tacit information from buyer to producer while the latter base information exchange primarily on price. When transaction complexity is high but uncodifiable, and there is high supplier capability, Gereffi et al. (2005) predict the emergence of relational value chains. The main difference between relational and modular value chains is that the lack of codifiability necessitates a greater degree of explicit coordination on the part of the purchasing firm than the simple exchange of codified information.

Captive value chains occur when both transaction complexity and codifiability are high, but the capability of the supply base in relation to it is low. In this case, the paucity of capable suppliers constrains outsourcing, so purchasing firms invest heavily in a single supplier, but attempt to lock them in to ‘exclude others from reaping the benefits of their efforts’ (Gereffi et al. 2005: 87). Thus, where modular suppliers might participate in the value chains of a great number of firms, captive suppliers do not, at least with respect to the types of input(s) they produce for the firm to which they are captive. Finally, when transaction complexity is high and both codifiability and supplier capability are low, purchasing firms will tend to internalize the production of a given input, leading to hierarchy.

The development of these new GVC categories stemmed from some perceived deficiencies of the GCC categories. For example, increasing levels of outsourcing across a number of industries seemed to erode the clear distinction between buyers and producers over time. Further, commodity chain analysts confronted different ways of organizing commodity chains across industries, including ‘triangle manufacturing’

in the garment industry. Here, lead firms in North America drew up contracts with intermediate firms, particularly in South Korea and Hong Kong, which in turn began to offshore garment assembly throughout the East Asian region (Gereffi 1999b). Thus, as one author notes, '(1) there was a clear shift away from the vertically integrated, producer-driven variant in a range of industries; and (2) the buyer-driven type could not characterize all of the network types being observed in the field' (Sturgeon 2009: 117). The new categories are thus seen as a solution to both the above mentioned problems because (1) changes in at least one of the variables leads to predictable shifts in the types of observed governance patterns and (2) the three sub-types of the network form capture a greater amount of observed variation than did the buyer-driven category.

While it seems clear that the buyer/producer-driven dichotomy is somewhat outdated in its original articulation and that the new GVC categories represent an improvement on it, it also seems that the GVC governance types lost some of the value added by the GCC types. First, the GVC types tend to obscure the agency of lead firms as the drivers of value chain creation. As I more fully develop below, the buyer/producer-driven dichotomy implied that the formation of a value chain was bound up with the competitive strategy of lead firms, which involves decisions about how much manufacturing to externalize as well as where to locate it. Therefore, for example, while the GVC categories do a very good job at predicting what governing mechanisms are available for coordinating a supply chain relationship, it is less clear what drives the establishment of that relationship in the first place.

Second, scholars developed the GCC governance typology with an attention to the ways in which the creation of value chains can foster economic development, particularly in the global South (Gereffi et al. 2001; Humphrey 2002; Kaplinsky 2000, 2005). However, while the GVC categories are obviously attentive to the role that supplier capabilities play in the ability of lead firms to externalize manufacturing activity, they are less attentive to the way in which these capabilities are distributed geographically. As one of its authors notes, this new GVC governance framework is a theory of linkages that 'may be forged within the same building, across town, or across great distances' (Sturgeon 2009: 123). As a result, they are not explicitly oriented towards predicting which types of linkages are more likely to diffuse to the global South, and they are even less oriented towards predicting the implications of different types of linkages for economic development. Thus, in the remainder of this article, I synthesize the GCC and GVC approaches in an attempt to fill these theoretical gaps. In particular, I articulate the importance of one variable that may bear a relationship to those that Gereffi et al. (2005) identified – the height of entry barriers to manufacturing – and draw out the implications of differential supplier capability across the North–South divide.

### **Entry barriers, the North–South divide and the 'globalness' of value chains**

In various ways, theories of national and international industrial organization informed both GVC and GCC theories of governance (Kogut 1984; Porter 1990;

Vernon 1966; Williamson 1981). These theories share a fundamental interest in the determinants of the specific value-added activities that fall within the boundary of the lead firm – the make or buy dilemma – as well as the geographical location of economic activity (Thun 2008). A complete theory of global value chain governance should therefore explain how lead firms determine which activities to exclude from within their formal boundaries, and where to locate externalized activities globally.

According to one influential author, value-chain governance results from the decisions that lead firms make when designing competitive strategy. A competitive lead firm is one that correctly determines ‘which link and which factor captures [its] advantage, and where the value added network [will break] across borders’ (Kogut 1984: 151). Thus, the governance of any given value chain is one that internalizes the activities within the lead firm for which it has the greatest *perceived* competitive advantage, and locates requisite external activities so as to maximize the *perceived* comparative advantage of alternative locations (Gereffi 1999b, 2005). This is entirely consistent with what was probably the central contribution of the buyer/producer-driven dichotomy, which drew its labels from differences in the role of lead firms across the two ideal types.

The key variable determining the location of a lead firm in the GCC scheme was the height of entry barriers across the various activities that make up the whole value chain (Gereffi et al. 2005; Gibbon and Ponte 2005; Kaplinsky 1998, 2005; Sturgeon 2009). While this list of entry barriers and the factors that determine them are extensive and sometimes ambiguous, the crucial outcome associated with them is low competition – or ‘rent’ – for the firm they protect (Kaplinsky 1998). Indeed, the GCC theory of governance emphasized the ‘increasing barriers to entry that exist as one moves along’ from subordinate to lead firms in the chain as a way to underline the desire of lead firms to keep the most competitive links in the chain ‘in house’ (Bair 2005: 165). Thus, the main point of similarity across buyer/producer-driven chains is that their structures reflect the most optimal location of activities, both inside and outside of the lead firm, *from the perspective of the lead firm*.

An important explanation for the variation in governance between buyer- and producer-driven networks is differences in the relative height of entry barriers *to manufacturing* between them (for example, Gereffi 1994; Gibbon and Ponte 2005). Gibbon and Ponte, for instance, associate differences in the height of entry barriers to manufacturing across buyer- and producer-driven commodity chains with the extent to which manufacturing functions remain internal to the lead firms:

In producer-driven chains ... barriers to lead-firm entry are located in large-scale, high-technology production facilities ... and manufacturers are the lead agents. ... Buyer-driven chains ... differ from producer-driven chains in that they have low barriers to entry in production ... [which is therefore] externalized to a competitive and decentralized system of subcontractors.

(Gibbon and Ponte 2005: 79)

Put differently, the extent to which lead firms keep a share of the manufacturing activity ‘in house’ is a function of the presence of extensive barriers to entry around it. The power of the buyer/producer-driven dichotomy is thus its ability to identify the concrete forms of economic activity that constitute the formal boundaries of the lead firm across different types of value chains.

The buyer/producer-driven governance dichotomy also implies that entry barriers have an impact on location decisions, though in an indirect way. At the most general level, lead firms that wish to externalize a phase of the manufacturing process must choose either to ‘outsource production to a firm across the street or offshore production to a firm overseas’ (Thun 2008: 358). The major benefit of offshoring to the global South is lower production costs, but potential supplier firms in the North have more capability, on average, than those in the South, and are therefore better able to absorb those activities (for example, Wood 1994). Indeed, this dynamic is observable even within the buyer-driven garment industry, which has lower entry barriers to manufacturing, on average, than most other industries (for example, Gereffi and Memedovic 2003; Gibbon and Ponte 2005; Uzzi 1996):

There is a clear status hierarchy among US [garment] retailers that affects where and how they engage in global sourcing. Fashion-oriented retailers that cater to an exclusive clientele for ‘designer’ products get their expensive, nationally branded goods from a small group of premium-quality apparel exporters (e.g., Italy, France, Japan). ... The large-volume discount stores that sell the most inexpensive products import from the lowest-cost suppliers, which frequently make relatively simple or standardized goods.

(Gereffi 1999b: 43)

Gereffi’s juxtaposition of the types of garment manufacturing activity that reside in Italy, France and Japan with those that reside with ‘low-cost suppliers’ suggests that manufacturing links in value chains are more likely to ‘touch-down’ in the global South where entry barriers to manufacturing are lowest because the requisite capabilities for these activities – be they labour force skills, capital or minimum amounts of experience in the industry – are low. For the same reason, manufacturing activity with at least moderate entry barriers is more prone to outsourcing than offshoring because Northern firms hold higher capabilities than firms do in less developed countries. Moreover, many production processes in industries with high entry barriers to manufacturing are of sufficient complexity to necessitate close relationships between the lead firms and their main suppliers. Thus, as Gibbon and Ponte note, ‘the geographic division of labor is less pronounced [in producer-driven chains] than in buyer-driven’ ones (Gibbon and Ponte 2005: 79).

A potential critique of this account of the buyer/producer-driven dichotomy is that it fails to account for the dynamic shifts in governance patterns observed in the literature, where purportedly producer-driven industries look increasingly buyer driven over time. This, however, is only true if we believe that entry barriers to manufacturing are not themselves dynamic. Indeed, a central claim of global value

chain analysts is that chain formation may lead to the erosion of entry barriers to manufacturing over time if suppliers can use an initial entry into activities with low entry barriers to upgrade their capabilities and thereby overcome the entry barriers of an increasing range of manufacturing activities over time (Kaplinsky 2005).

**Figure 1: The relationship between the degree and geographic scope of global value**

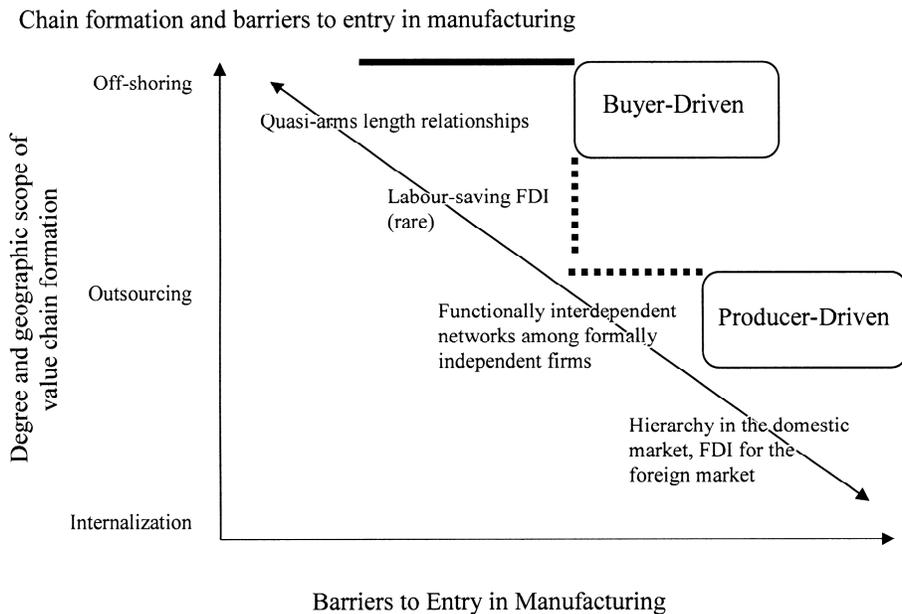


Figure 1 illustrates the relationship between entry barriers to manufacturing and the degree and geographic scope of value chain formation. The most global value chains reside in the upper left quadrant of Figure 1, where entry barriers to manufacturing are the lowest. This area of the diagram is ideal-typical buyer-driven governance, where the lead firm engages in zero manufacturing and its relationships with its suppliers are informal, typically restricted to the hand-off of design elements in very basic types of goods, the setting of quality standards and the specification of the size and timing of a given product run. The least extensive level of global value chain formation occurs in the lower right hand corner of Figure 1, where entry barriers to manufacturing are highest. In this corner, the literature on the multinational corporation holds, as lead firms either produce both in-house and domestically to service the local market, or engage in FDI (foreign direct investment) to access foreign markets (Dunning 1981; Hymer 1976).

At low to intermediate entry barriers, we might observe labour-saving FDI, in which lead firms engage in FDI to produce in a foreign location for export back to the home market, or to a large market outside the home country. There are reported examples of this type of investment in the garment and electronics industries, where subcontracting firms will locate assembly operations abroad (Schrank 2004, 2008;

Sturgeon 2002). This activity falls within the buyer-driven category because the intermediate supplier, rather than the lead-firm, actually engages in FDI. Finally, intermediate to high levels of entry barriers are indicative of the types of relationships described in the literature on the producer-driven automobile and aerospace industries. While the firms are formally independent, they are functionally interdependent, spending a great deal of time engaged in collaborative or quasi-collaborative activity in modular and relational value chains. Moreover, while the lead firms are major producers in these networks, the first-tier suppliers may actually organize much of the offshoring that does occur, indicating the potential coexistence of different types of linkages within the same governance structure – one type between the lead firm and the first tier suppliers, and another type between the first and lower tier suppliers.

Figure 1 also illustrates that one can best conceptualize the original buyer/producer-driven governance scheme as a continuum running between the buyer- and producer-driven ideal types. The categorical names are indicative of whether or not lead firms engage in manufacturing, and the continuum running between them suggests the many types of interfirm relationships one might observe as entry barriers to manufacturing rise/fall. Moreover, the continuous nature of the differentiation implies change in governance types between the ideal-typical buyer- and producer-driven categories over time. As early suppliers gain capability and erode the entry barriers to an increasing array of manufacturing activity, the value chain will become more geographically global in scope. The sequence likely begins when lead firms form interdependent relationships with first-tier suppliers, who themselves engage in either offshoring or labour-saving FDI. As these first-tier suppliers increase their capability, lead firms will tend to shift out of manufacturing entirely. The first-tier suppliers will take on the bulk of the manufacturing activity through a combination of own manufacturing, outsourcing, offshoring and labour-saving FDI – a process that seems to have been underway in the US electronic industry since the early 1990s (Linden et al. 2009; Sturgeon 2002).

### **Value chain governance and the fragmentation of production: electronics, garments and transportation equipment**

The above discussion highlights the ability of the original buyer/producer-driven governance scheme to make predictions about the ‘globalness’ of value chains. The differentiation of buyer- from producer-driven commodity chains rests on differences in the height of entry barriers to manufacturing between them. First, the height of entry barriers to manufacturing affects the relative proportion of manufacturing activity that remains within the formal boundary of the lead firms, which essentially construct value chains to reduce the competition around their own activities. Second, the height of entry barriers also has an impact on the geographic scope of sourcing behaviour because firms in the South have lower capability, on average, than those in the North, and lead firms are therefore *less likely* to offshore the relatively skill-, capital-, technology- and knowledge-intensive manufacturing functions they, at least

initially, externalize. Taken together, the theory yields a clear expectation for variation in the average level of global offshoring behaviour across industries: it should be higher in prototypically buyer-driven chains than in producer-driven ones.

To bring empirical evidence to bear on this claim, I compare overall levels of global offshoring behaviour across three global industries – garments, electronics and transportation equipment. I chose these industries for three related reasons. First, these three industries are probably the most heavily studied from the global value chains perspective. Second, two of these industries – garments and transportation equipment – are universally regarded as archetypically buyer- and producer-driven and characterized as having very different levels of entry barriers between them. This gives them high face validity as representatives of the buyer- and producer-driven ideal types (Bair 2005; Gereffi 1994; Gibbon and Ponte 2005).

Third, the electronics industry is a special case that provides a natural experiment to gauge the explanatory power of the synthesis. Much like the early days of garment/textile manufacturing, the electronics industry began as a prototypical producer-driven industry where the lead firms engaged in the lion's share of the manufacturing activity (Dicken 2007; Kraemer and Dedrick 1998; Sturgeon 2002). Yet, the present-day electronics industry is highly networked and, in the production network and value-chains literature, exemplifies modularity (see, for example, Ernst 1997; Gourevitch et al. 2000; Sturgeon 2002). This reality is particularly striking when one considers the age of this industry, which is hundreds of years newer than the garment industry and roughly eighty years newer than the automobile industry, and therefore globalized quickly relative to its age.

However, the pace and timing of networked production reflect dynamic changes in entry barriers to manufacturing in the industry. The earliest moves to networked production looked much like today's automobile industry. Starting in the 1970s, 'high-value activities [were] typically located in the home country; the activities of overseas subsidiaries [were] rationalized ... low-value-adding', and concentrated in East Asia (Ernst 1997: 29; Morrison and Roth 1992; Sturgeon 2002). Over time, however, supplier firms used their initial entry into the industry to expand their competencies and thereby erode the entry barriers of higher-skilled production processes. Indeed, the industrial upgrading that followed from initial outsourcing/offshoring behaviour in the US electronics industry affected the prospects of future outsourcing/offshoring at both the firm and industry levels. As one observer of the US electronics industry notes:

Outsourcing has led to a deepening of competence and an increase in scale at supplier firms ... [that co-evolve with lead firms] in a recursive cycle of outsourcing and increasing supply-base capability and scale, which makes the prospects for additional outsourcing more attractive, not just to the lead firms that drove the upgrading of the supply base in the first instance, but for those lead firms just beginning to seriously consider large scale strategic outsourcing.

(Sturgeon 2002: 455)<sup>2</sup>

The internalization of a growing proportion of the manufacturing activity by early upgrading suppliers in turn drove the lower-skilled processes to an increasing number of low-wage countries, either through offshoring or labour-saving FDI, so that an increasing proportion of the overall manufacturing activity was done offshore (Gourevitch et al. 2000). By the early 1990s, supplier capabilities outside the global North were such that lead firms could outsource the majority of the manufacturing to a select group of OEM (original equipment manufacturers) suppliers with factories across the developed and developing world.

In short, the electronics industry began as a prototypical producer-driven industry with limited offshoring. However, initial experimentation with outsourcing resulted in the erosion of entry barriers to manufacturing as supplier firms upgraded their capabilities through ‘learning by doing’, and we have therefore been ‘witnessing a one-time transition in the electronics industry from in-house to out-of-house manufacturing’ since the early 1990s (Sturgeon 2002: 464). In other words, the electronics industry is experiencing a shift from more producer-driven to more buyer-driven governance, and occupies an intermediate position on the scale depicted in Figure 1. Thus, one would expect that the electronics industry would manifest rates of global offshoring that were synchronous with the producer-driven transportation equipment industry through the early 1990s, after which it would manifest an offshoring trajectory comparable to that of the buyer-driven garment industry.

The synthesis of the GCC/GVC theory of network governance developed above is thus consistent with the following hypotheses:

1. The ordering of industries in terms of the overall levels of global offshoring behaviour will be garments → electronics → transportation equipment.
2. The ordering of industries in terms of the overall rates of increase in global offshoring behaviour will be garments → electronics → transportation equipment.
3. However, the timing of increased offshoring will come later for the electronics industry because of its young age and comparatively recent aggregate decline in entry barriers to manufacturing.

It is difficult to compare overall rates of offshoring behaviour across industries because the sheer complexity and number of firms involved in offshoring behaviour belies a straightforward comparison at the firm level. Moreover, ‘publicly available and detailed information at the level of firms is generally lacking’, which is partly due to the proprietary nature of a firm’s sourcing behaviour (Gereffi 2005: 169). Thus, I extend a methodology designed to compare the overall amount of production fragmentation at the country level to the level of global industries.

Feenstra argues that a country’s ratio of manufacturing trade to value added in manufacturing reflects the overall extent to which production is fragmented in that country. In other words, ‘the disintegration of production itself leads to more trade, as intermediate inputs cross borders several times during the manufacturing process ... because while the denominator is value-added, the numerator is not, and will “double-count” trade in components and the finished product’ (Feenstra 1998: 34). The key

point is that value added at the country level measures the cost of the activity performed within the country, minus the cost of imported inputs. If a firm assembles garments from cut fabric it imports, that firm only counts the labour involved in the actual assembly as value added. However, the cost of the cut fabric will be counted twice in the value of trade – once when the assembling firm imports it and once when it is exported back in the form of a garment.

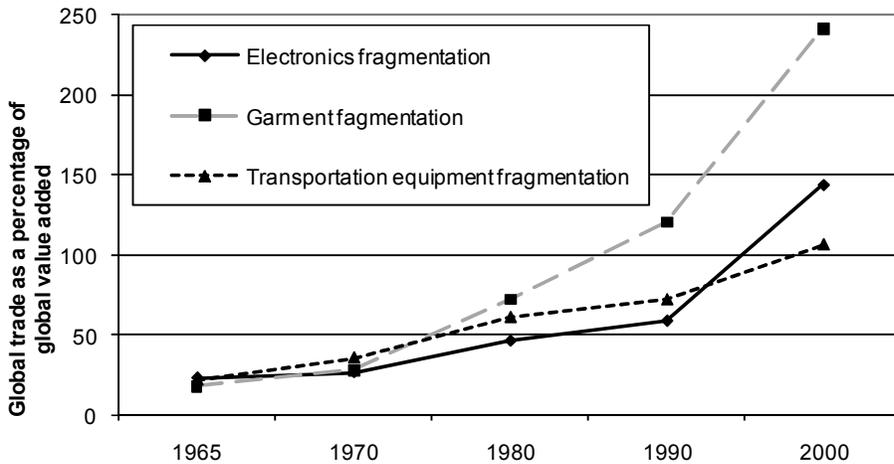
A real world example of this phenomenon arises from the production of Apple's iPod. A recent study disaggregated the retail value of an iPod among the three countries primarily involved in its production and distribution, namely the USA, Japan and China (Linden et al. 2009). The study found that Japan exports the bulk of the components to China for final assembly, which creates an export flow of \$146 from Japan to China, per iPod. China adds \$4 of value in assembly, and then exports the assembled iPod to the USA at \$150, which counts as trade both the value added by Chinese firms and the import price of the components. (Hamilton and Gereffi 2009: 145; Varian 2007). Thus, the overall contribution of an individual iPod to trade in the industry in which it is classified is \$146 (when the components are shipped from Japan to China), plus \$150 (when the assembled iPod is shipped from China to the USA) for a total of \$296. That is, the iPod value chain leads to a global trade flow that is almost 100 per cent higher than the actual global value added in component manufacturing and assembly, assuming no additional components were shipped to China from other countries.

Applying this same logic to global industries, one would expect that the ratio of industry-specific global trade to industry-specific global value added would be indicative of the industry's level of offshoring behaviour. As the number of countries involved in the production of a good increases, the extent to which value added in manufacturing is double counted in trade will also increase for the industry in which the good is classified. Thus, just as the ratio of manufacturing trade to manufacturing value added indicates the extent to which a country engages in offshoring behaviour with other countries, the same ratio for a global industry indicates the level of offshoring behaviour therein.

To compare the overall levels of offshoring behaviour for the global garment, electronics and transportation industries, I collected data on world trade and world value added for each industry. Data on world trade come from the UNCOMTRADE database, which classifies trade according to the standard industrial trade classification (SITC) Rev. 1 (United Nations 1963). For garments, I use category 84 (wearing apparel, except footwear). For electronics, I use category 72 (electrical machinery, apparatus and appliances). For transportation equipment, I use category 73 (transport equipment). The data on value added come from the UNIDO's industrial statistics database, which classifies value-added activities according to the international standard industrial classification (ISIC) Rev. 2 (UNIDO 2006). For garments, I use category 322 (manufactures of clothing). For electronics I use category 383 (manufactures of electrical machinery) and, for transportation equipment, I use category 384 (manufactures of transport equipment).<sup>3</sup> I collect both the trade and value-added data at five points in time – 1965, 1970, 1980, 1990 and 2000. Following

Feenstra (1998), I measure the overall level of production fragmentation at the global-industry level as the ratio of global trade to global value added for that industry. These ratios are expressed as percentages in Figure 2.

**Figure 2: Variation in level and rate of offshoring across three networked industries**



	Garments	Electronics	Transport equipment
Increase in offshoring behaviour, 1965–2000	1234.5%	524.9%	391.0%
Period of fastest relative increase	1970–1980	1990–2000	1970–1980

Note: trade data come from UN (1963), value added data come from UNIDO (2006). Fragmentation is measured as the ratio of commodity specific world trade to commodity specific world value added (x 100).

Figure 2 tracks the level, percentage increase and period of the fastest percentage increase in production fragmentation in the electronics, garment and transportation equipment industries from 1965 to 2000. There are two crucial points worth reviewing. First, offshoring became much more salient after 1980 across all three industries, but in the garment industry it was already becoming fairly pronounced after 1970. Second, the aggregate level of offshoring was much higher in the buyer-driven garment industry than the producer-driven transportation industry after 1980, which is roughly consistent with the onset of economic globalization. The electronics industry is somewhat unusual. Its level of production fragmentation was the lowest of all three industries until 1990, after which it fragmented rapidly so that it was higher than the transportation equipment industry but lower than the garment industry in 2000. The figure also suggests that the electronic industry's rate of fragmentation was roughly parallel to the transportation industry prior to 1990 (with a lower level), after which it literally exploded in a manner similar to the garment industry.

In short, the data generally support the hypotheses developed above. By 2000, the industries ordered in a predictable manner – the buyer-driven garment industry was the most globally fragmented, followed by the transitional electronics industry, while the producer-driven transportation industry was the least globally fragmented. Moreover, the rate of increase in global offshoring behaviour is ordered in exactly the same way: garments globalized quickest, followed by electronics and then transportation. Finally, the electronics industry's transition from more producer-driven to more buyer-driven is evident in that its fastest relative increase was in the most recent period compared with the 1970–80 period for garments and transportation equipment.

### **North/South supplier differentials and the spatialization of value-chain linkages**

I have thus far shown that the original buyer/producer-driven dichotomy is capable of making predictions about the globalness of value chains. Lead firms in industries with relatively high entry barriers to manufacturing tend to internalize a greater proportion of their manufacturing, and are more likely to outsource than offshore the activity they do externalize. However, I have yet to speak to the kinds of insights drawn from the newer GVC governance categories regarding the types of value chain linkages between purchasing and supplying firms. Thus, in the remainder of the article I synthesize the two approaches to global value chain governance. To synthesize the GVC categories with the original GCC categories, I introduce the height of entry barriers to manufacturing as an intervening variable and follow Gereffi et al. (2005) by allowing it two values, either high or low. I further differentiate between suppliers in the global North and those in the global South by allowing for relative capability differentials between them.

When entry barriers to manufacturing – such as requisite labour skills, capital requirements and industrial experience – are low, production processes are often simple and highly standardized. Thus, on average, the complexity of the transaction required for a viable outsourcing relationship also tends to be low. As Gereffi et al. (2005) suggest in note 10 of their article, low complexity is unlikely to co-occur with low codifiability, so codifiability must also be high when complexity is low. The only GVC category that includes low complexity and high codifiability that Gereffi et al. (2005) discussed at length was the market type, where capabilities in the supply base are also high. Once we consider the location of suppliers across the North/South divide, however, it becomes clear that suppliers in both the North and South will have sufficient capabilities relative to the complexity of the transaction. Where Northern and Southern suppliers are both sufficiently capable, lead firms will tend to prefer those in the South because of the savings in production costs, and therefore offshoring is more likely.

On the other hand, when entry barriers to manufacturing are high, the complexity of the transaction necessary for some type of outsourcing should also be higher. In this scenario, the codifiability of the transaction can be either high or low according to Gereffi et al. (2005), but Northern suppliers will have higher capabilities relative to these transactions than their counterparts will in the South. The two GVC governance

types that combine both high complexity and high supplier capability are modular and relational value chains, which should therefore be more likely to characterize the linkages between the lead and supplier firms confined to the global North. The two GVC governance types that combine high complexity with low supplier capability are captive and hierarchy, which should therefore characterize the linkages between lead firms and suppliers when the latter are located in the global South.

**Table 2: GVC types by GCC types across the North–South divide**

		Global value chain categories according to location of potential supplier	
		Global North	Global South
Global commodity chains dichotomy	<b>Producer driven:</b> High entry barriers to manufacturing	Modular, Relational	Captive, Hierarchy (FDI is most likely)
	<b>Buyer driven:</b> Low entry barriers to manufacturing	Unlikely	Quasi-Market/ Modular

Table 2 summarizes this argument by reporting the spatialization of GVC linkages that follow from the relationship between the height of entry barriers to manufacturing, transaction complexity/codifiability and supplier capability differentials across the North–South divide. If entry barriers to manufacturing are high (top row), capable suppliers will tend to be located in Northern countries and typically proximate to the lead firm. Thus, one would expect an extensive amount of modular and relational value chains to occur within Northern countries. When these chains cross the North–South divide, the modal process will be FDI. FDI can occur either as a solo venture on the part of the lead firm or first-tier supplier, which results in a subsidiary (and thus hierarchy), or as a joint venture with a domestic firm that results in a captive supplier. On the other hand, low entry barriers to manufacturing (bottom row) suggest that the capability of the supply base in relation to the transaction will be high in the global South, which promotes offshoring. While the form of production in this context remains nominally networked – the lead firms coordinate the supply base by determining price, quality and quantity outcomes – the prevailing linkages between them and their suppliers will resemble quasi-market relationships that are largely determined by considerations of cost, where switching suppliers is relatively easy and costless for the lead firm. However, if we allow for variation within Southern places, with some containing higher aggregate capability than others, we might also expect modular-like linkages between lead firms and upper-tier suppliers located in relatively skill-rich areas of the South when entry barriers to manufacturing are intermediate (Bair and Gereffi 2001; Gereffi 1999b).

This synthesis speaks to Gibbon and Ponte's (2005: 82) distinction between 'different forms of coordination between actors in different functional positions in a GVC', and the 'overall form of governance'. For Gibbon and Ponte, the importance of the buyer/producer-driven dichotomy is that it captures the agenda-setting function of lead firms. These firms develop governance structures in the context of a 'specific allocation of resources and distribution of gains', which lead firms perceive to be skewed in their favour (Gibbon and Ponte 2005: 83; Kaplinsky 2000, 2005). What I have tried to show here is that a way forward might be to consider the GVC types as nested forms of coordination within the buyer/producer-driven dichotomy. For example, we should expect a supplier firm located in a Southern country producing in the context of a producer-driven value chain to be a captive supplier, or quasi-subsidiary, to either the lead firm or the first-tier supplier co-headquartered with the lead firm.

On the other hand, we can expect the linkages of a supplier firm located in a Southern country producing in the context of buyer-driven value chains to resemble the market and modularity types, depending to some degree on the relative height of entry barriers and resultant transaction complexity. In short, not only does the buyer/producer-driven dichotomy preserve its utility as a governance classificatory scheme, but combining it with the newer GVC variant achieves a 'fine-tuning of the concept by adding underlying components [that] make predictions about' the spatialization of concrete forms of linkages (Gibbon and Ponte 2005: 87). While the buyer/producer-driven typology highlights the role of entry barriers to manufacturing as determinants of both the make/buy dilemma and locational decisions, its coupling with the newer GVC categories produces a more general theory of the spatialization of inter-firm linkages in the global economy.

## **Conclusion**

Global value chain analysis is a vibrant and growing approach to the transnational architecture of the global economy. One of the central elements to this approach is the development of theories of chain governance – what are the rules of chain participation, who determines them and to what ends? In this article I contribute to theory building in global value chain analysis by synthesizing the original GCC governance scheme with the more recent GVC governance categories. Drawing from the buyer/producer-driven dichotomy, I highlight the role of entry barriers to manufacturing as determinants of the willingness of lead firms to externalize manufacturing activity. Drawing from the more recent GVC categories, I suggest that differential levels of supplier capability across the North–South divide are important determinants of the extent to which externalized activities are ultimately offshored. The globalness of value chains is higher in industries with low entry barriers to manufacturing because lead firms will tend to externalize a greater share of manufacturing and encounter a much larger pool of capable suppliers in the global South.

The empirical evidence provided largely supports the synthesis. Between 1965

and 2000, the archetypically buyer-driven garment industry (where entry barriers to manufacturing are reportedly low) became the most global while the archetypically producer-driven transportation industry (where entry barriers are reportedly high) became the least global. Moreover, the electronics industry provided a natural experiment with which to gauge the explanatory power of the theory because it transitioned from a producer-driven to a more buyer-driven form of governance *circa* 1990, when early supplier firms eroded the entry barriers to manufacturing in an increasing array of manufacturing niches. As such, it demonstrated an intermediate level of fragmentation over the same period, and its transition to a more buyer-driven like trajectory coincided with the timing of the shift in sourcing behaviour identified by industry analysts (see, for example, Sturgeon 2002).

Coming full circle, I argue that a way forward is to consider the GVC categories as nested coordination mechanisms within the broader GCC categories. The overall GCC drivenness of the chain determines how much manufacturing activity is externalized from within the formal boundaries of lead firms at any given point in time. Further, the specific types of linkages between lead and supplier firms will depend, at least partially, on the location of supplier firms across the North–South divide because those in the South have lower capabilities than those in the North. Thus, some types of value chain linkages – modularity and relational value chains – are more likely to occur when lead firms and suppliers are confined to Northern countries. On the other hand, other types – captive, hierarchy and market based – are more likely to occur when the supplier is located in the global South. Taken together, then, the two approaches yield a theory of both the globalness of value chains and the spatialization of specific value chain linkages.

One cannot avoid the normative implications of this synthesis. Indeed, much of the impetus for research on the network form of economic organization is the sense that by ‘cultivating long-term cooperative relationships that have both individual and collective level benefits’ (Granovetter 1985; Piore and Sabel 1984; Powell 1990; Uzzi 1996: 693), it tends to limit the lead firms’ self-interest maximizing opportunistic behaviour. Yet, the perspective adopted here suggests that many of the highly celebrated network forms of economic organization described in the literature may be somewhat limited to the linkages between lead firms and first-tier suppliers within the global North. Because Northern firms have higher capability relative to just about any transaction, they are much more integral to the value chains of lead firms than are their counterparts in the global South, which probably generates a high degree of value-chain interdependence and egalitarianism. In contrast, value chains that criss-cross the North–South divide are probably much more characterized by the purchasing firm’s (whether they be the lead firm or its first-tier supplier) ‘asymmetrical ability to take make or buy decisions and consequent asymmetrical flexibility to shift between partners’ than are those confined to the global North (Gibbon and Ponte 2005: 83).

It is important to place boundaries around the types of generalizations this synthesis implies and address its shortcomings. First, this synthesis is deterministic only for groups of value chains in similarly driven industries, but is probabilistic for

individual value chains. On average, value chains in buyer-driven industries should be more globally extensive and led by firms with an exceptional degree of power *vis-à-vis* suppliers because of the extremely low entry barriers to manufacturing therein when compared with producer-driven chains. Nevertheless, this does not rule out exceptions. The high fashion niches of the garment industry, exemplified by the industrial districts of Northern Italy or the clusters centred in New York, Los Angeles and Paris, are perhaps less globally extensive and more vibrantly networked than the links between first- and lower-tier suppliers in the automobile industry, where purchasing firms use their strategic position to confront producers with ‘an annual demand for price reduction’ (Brusco 1982; Kaplinsky 2005: 146; Uzzi 1997). While to some extent one can explain these outliers from within the theory – the height of entry barriers to manufacturing in the high fashion niche of the garment industry are closer to those in the low-end component sector of the automobile industry than is the average height of entry barriers to manufacturing between the two industries – they still point to the need for caution in over generalizing from the drivenness of a given industry to the linkages characterizing any particular value chain within it.

Second, the proximate causes for variation in governance across GVCs are the height of entry barriers to manufacturing and the differential capability of suppliers across the North–South divide. Yet, the value-chains literature under specifies what factors contribute to the formation and maintenance of entry barriers. Indeed, while the discussion above was at least limited to entry barriers *to manufacturing*, further specification would be helpful. For example, garment manufacturing requires relatively low skills, little capital, utilizes some of the oldest production technology in the world, and the knowledge required to set up shop is basic. On the other hand, automobile manufacturing requires a labour force with higher skills, a large amount of fixed capital investment, an extensive amount of prior knowledge about the manufacturing process, as well as sophisticated manufacturing technology. In other words, any or all of these four more specific variables – labour skills, capital intensity, technology and industrial experience – could, when directly comparing different types of value chains, serve as proxies for an abstract notion of barriers to entry.

However, some types of barriers to entry, such as government protectionism and other institutional factors, are probably more important for some industries (the automobile industry) than others (the garment industry). It would therefore be helpful if future researchers could develop a set of protocols for drawing boundaries around the types of industry characteristics that would be relevant to the formation of entry barriers when comparing across different types of value chains. Nevertheless, the approach adopted here, where global industries are the unit of analysis and are subject to direct comparison, provides a fruitful direction for future research. Indeed, while ‘field research on industry-specific GVCs remains as important as ever’, it would be strengthened by an attention to comparisons both between industries and over time, coupled with a theoretical refinement of some of the major concepts mobilized to explain variation in the network form of economic organization at the global level (Sturgeon 2009: 134).

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## **Notes**

1. Given the three variables, there are actually eight possible combinations. However, we can rule out two of them because if the complexity of a transaction is low, its codifiability must be high by definition – low complexity and low codifiability are unlikely to co-occur (Gereffi et al. 2005: 100 n.10). The third – low complexity, high codifiability and low capability in the supply base – is an interesting case but not discussed at length, probably because low complexity and low capabilities in the supply base are also unlikely to co-occur.
2. Sturgeon also places a great deal of emphasis on the importance of codified information transfers as an explanation for the transformation of the electronics industry. However, the process of codifying information transfers between lead and supplier firms seems to presuppose the existence of capable suppliers. Consequently, it is not that much of a leap to suggest, as Sturgeon in fact does, that ‘the groundwork for the emergence of external economies in electronics production has been the continued growth and increasing competence of supplier firms over time’ (Sturgeon 2002: 473).
3. The ISIC categories are determined according to the production process, while the SITC categories are determined according to the final product. Thus, the correspondence between activities classified according to the ISIC and SITC is less than one-to-one in some categories, especially at lower levels of aggregation. However, the SITC value-added figures used here refer only to manufacturing activity for these industries, and the three-digit ISIC level of aggregation provides a nearly one-to-one correspondence to the two-digit level of aggregation I used for the SITC trade data.

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