“Governed” Trade: Global Value Chains, Firms and the Heterogeneity of Trade in an Era of Fragmented Production

Review of International Political Economy (Forthcoming, 2015)

Mark P. Dallas

Union College, Schenectady NY & Harvard University, Cambridge MA

Fairbank Center for Chinese Studies
CGIS South Building
1730 Cambridge St.
Harvard University
Cambridge, MA 02138

Department of Political Science
211 Lippman Hall
Union College
Schenectady, NY 12308
Email: dallasm@union.edu

Mark Dallas is an Assistant Professor of Political Science and Asian Studies at Union College in New York, and was an An Wang Postdoctoral Fellow at the Fairbank Center for Chinese Studies at Harvard University in 2013-14, where this research was conducted. Generous funding was provided by Union College
ABSTRACT
Over the past several decades, firms have de-verticalized and internationalized increasingly complex manufacturing and service functions, a phenomenon studied across the social sciences. However, the disciplines disagree over whether the fragmentation of production is substantively novel, requiring amendments to trade theory, or is simply a secular deepening of the international division of labor. Some economists view it as “just trade,” driven by well-known actor-less determinants, such as factor endowments, technology, and returns to scale, while more recent firm heterogeneity trade theories consider firm behavior. By contrast, other heterodox social science approaches differ by focusing on the strategic actions of firms and sector-specific governance as independent drivers which “govern” trade and determine the division of value between countries. This paper develops novel measurements by utilizing unique transactional trade data – the raw firm-level trade transactions that comprise standard inter-country trade statistics – on 439 of China’s largest exporters in eighteen sub-sectors of the electronics and light industries, to examine whether trade is heterogeneously governed in ways theorized by the global value chains (GVC) literature. It finds substantial empirical support for GVC-governed trade, and advances both GVC and firm-centric trade theory along several fronts.

KEYWORDS
Governance; International Trade; Global Value Chains; Firm Heterogeneity; Vertical Specialization; China; Transactional Trade Data; Multinational Enterprises (MNE)

INTRODUCTION
Globally, production has fragmented as firms de-verticalize, de-agglomerate and internationalize finer slices of their value chains – a phenomenon that goes by different names across the social sciences, including vertical specialization, the disintegration of production, global value chains, and global production networks, to name but a few. Multinational enterprises (MNEs) are now estimated to conduct a third of world exports though their direct affiliates, and “non-equity modes” of international production, such as contract manufacturing, licensing or service outsourcing, account for more than $2 trillion in sales and are growing rapidly (UNCTAD, 2011). This has engendered unprecedented complexity and functional integration in the conduct of international production and trade, which poses serious challenges in accurately measuring the international economy. Standard trade statistics, created for an earlier era with less complex fragmentation, are poorly equipped to observe “borderless
production systems...[consisting of] sequential chains or complex networks and which may be global, regional or span only two countries.” (UNCTAD, 2013: 122).

One critical question is whether the increasing fragmentation of production and trade is something theoretically new which requires a re-theorizing of international economics, such as trade theory, or whether it is merely a secular deepening of the international division of labor, but otherwise theoretically insignificant. On the one hand, most trade economists perceive fragmented production – often called “vertical specialization” in the discipline – as only a deepening of inter-country specialization and trade. For instance, Bhagwati, Panagariya and Srinivasan (2004: 94) succinctly conclude that “outsourcing is fundamentally just a trade phenomenon; that is, subject to the usual theoretical caveats and practical responses, outsourcing leads to gains from trade, and its effects on jobs and wages are not qualitatively different from those of conventional trade in goods.” While these authors were specifically concerned with services outsourcing, they articulate a common view among economists, that fragmented production is “just trade” and poses few challenges to trade theory (Markusen, 2005: Mankiw and Swagel, 2006; Blinder, 2009). Two prominent trade economists call this school of thought “fragmentation in otherwise neoclassical models” (Antras and Rossi-Hansberg, 2009).

In this approach, trade – and by extension vertically-specialized trade – is measured as aggregate flows between countries, but with no theoretically significant role for firms. Second, trade is conducted between sectors that vary by degrees in terms of factor inputs, trade costs, and returns to scale, rather than considering sectors as categorically different due to sector-specific dynamics. Thus, trade as inter-country flows is homogeneous, in the sense that identical products exported from a single country (e.g. Chinese cotton men’s garments) should exhibit little intra-product variation in the conduct of trade, given that product and country
characteristics like factor endowments, production productivity, trade costs and returns to scale, are identical. Because trade is analyzed as a phenomenon between countries, heterogeneity in the characteristics of suppliers of the exporting country or among buyers in importing countries is simply not part of the analysis. Firms are considered epiphenomena of sweeping market forces.

Recent innovations in trade theory depart from the “just trade” view of vertical specialization by placing firms at the center of analysis, including “firm heterogeneity,” “multiproduct firms” and “organization and trade” literatures, among others. As discussed in detail below, these literatures come closest within economics to opening the black box of the role of firms in international trade, by illustrating previously unappreciated gains from trade derived from differences between firms, not just differences between countries.

However, they have not gone as far as sociologists and geographers – generically grouped under the rubric “global value chains” (GVC) in this paper – in examining the extent of heterogeneity across firms and in arguing for its importance to firm upgrading, national development and ultimately policy prescriptions. Specifically, GVC researchers differ with economists in terms of: the importance of firm strategy (which creates variation in types of firms), sector-specific organization, and the varieties of inter-firm linkages – variables that form the bedrock of GVC theory. GVC scholars view trade as heterogeneous because they focus on the varying roles that firms play within an industrial ecosystem, such as various global buyers, contract manufacturers, and service outsourcers, among others. In some GVC theories, trade is driven by powerful “lead” firms that strategically coordinate the international production process, buyer-supplier linkages and flow of resources. In other versions, there are broader industry-specific dynamics and technical characteristics (e.g. the complexity or codifiability of transactions) which structure inter-firm governance. Thus, powerful, strategic firms and sectoral
organization give rise to *categorically different* inter-firm governance mechanisms, which create heterogeneity in the conduct of trade that are substantively significant in terms of returns to capital and labor, and the formulation of industrial policy. As a result, trade heterogeneity should be observable at the level of narrow product categories – like Chinese cotton men’s garments – which is the level of analysis adopted in this paper by utilizing Chinese transactional trade data.

Empirically, GVC approaches differ by arguing that international trade is “channelized,” meaning that trade is divided between some channels that are “governed” by firms and sector-specific dynamics that operate as independent drivers of trade, while the remaining channels of trade are conducted through more pure market forces, predominantly by price. As discussed later, this heterogeneity is also indicative of variance across firm functions and capabilities, which recommends a proper theory of the firm. This contrasts with the relatively “actor-less” factors preferred by most trade economists (and often adopted by scholars of “open economy politics”), like technology, endowments and returns to scale, through which sweeping market forces predominate. While GVC research and recent firm-centric trade theory have more areas of common convergence, they also differ in terms of firm and sectoral attributes. For the former, firm strategy and sector-specific organization engender trade heterogeneity, while for the latter, firm size and productivity principally shape firm-generated trade patterns. This paper examines only the largest Chinese firms and yet it still finds substantively important heterogeneity in firm attributes, even when controlling for firm size.

One shortcoming of GVC scholarship, however, is that its insights derive largely from case studies, most often of single industries, which some scholars have criticized for its “selection bias” (Milberg and Winkler 2013). Others have warned that “extrapolations from specific case
studies and instances must be treated with caution” because the lack of generalizability makes valid descriptive and causal inferences very difficult (Dickens, et al., 2001: 89). To overcome these shortcomings and foster dialogue with trade theorists, this paper utilizes a unique database containing millions of lines of export transactions conducted by 439 of China’s largest exporting firms, and compares across eighteen distinct sub-industries, which are nested within the broad categories of electronics and light industries – China’s largest export sectors.

Unlike standard trade data which record aggregated trade flows between countries, these data are drawn from the raw transactions conducted between firms and can be aggregated to the establishment, firm and product levels. As such, they permit in-depth examinations of the trading behavior of individual firms within their sectors, and thus provide a new and untapped source of data for scholars of IPE to measure and analyze the international economy from a firm-level perspective. This paper examines whether different inter-firm governance mechanisms within and between narrow sub-industries systematically generate heterogeneity in firm-level trade behavior along the lines theorized by the GVC literature. While it finds generally strong support for heterogeneity in trade patterns across governance mechanism – including differences in modular, relational-captive and market-based governance – it also finds that the GVC literature requires more focus on comparative sectoral analysis, and intra-industry differentiation; furthermore, it develops new empirical measurements for future GVC research, like transactional stability and export specialization.

This paper’s transactional trade data, however, are limited to the largest firms of a single country, China, and are able to measure only certain dimensions of firm-generated trade heterogeneity. This means that it cannot address issues specific to SMEs, or trade heterogeneity based on product quality or the countries where products are sold (called “final markets”
heterogeneity in GVC, and “extensive margins” in trade theory) – all potential topics for future research.

The following section introduces and compares the different approaches to fragmented production. This is followed by a more in-depth analysis of GVC theory so that hypotheses regarding industry and firm-level trade transactions can be generated, before being empirically examined in the final section.

I. Fragmented Production across the Disciplines

Notwithstanding the points of divergence between economic and other social science approaches to trade, there is substantial common ground over which the disciplines agree. First, they agree that fragmented production represents an important transformation which involves a deeper functional integration between countries. In economics, this is well represented by the “complex integration” literature which acknowledges the increasing complexity of MNE investments abroad and intra-firm trade. Many trade models have been developed which consider the most efficient combination for MNE investments when there are several countries, the possibility of both vertical and horizontal FDI and both intermediate and final goods trade (Yeaple, 2003; Helpman, Melitz and Yeaple, 2004).

With their characteristic focus on developing countries, GVC scholars are also keenly concerned with the opportunities and limitations engendered by the functional integration of developing and advanced countries through fragmented production. On the one hand, fragmentation lowers barriers to entry for developing country firms, by which they can gain footholds in export-led manufacturing, even in technologically sophisticated industries. Entry into manufactured goods exports was far more difficult for developing country firms in a world
of vertical integration, because it often required mastery across all stages of innovation, production, marketing and distribution (Breznitz 2007). Furthermore, while the particular slice of the value chain which is outsourced to a developing country may initially correspond to its comparative advantage, the mere entry into a value chain offers unprecedented potential for upgrading. This is possible through a co-evolutionary “ratchet effect” as powerful lead firms coordinate with their suppliers, who in turn can upgrade into new value chain niches.

However, specialization in only small fragments of complex value chains coordinated by powerful lead firms, can also trap firms into low-end manufacturing. This is because lead firms sometimes intentionally restrain their suppliers from entering value chain functions which they continue to find profitable, or such “partitioning” can simply be due to a supplier’s functional distance from the centers of innovation, planning and development – phenomena well documented across different industries (Dolan and Humphrey, 2000; Humphrey and Schmitz, 2002; Navas-Aleman, 2011).³

Second, economists and sociologists are engaged in a similar empirical endeavor – specifically, conceptualizing and measuring the division of “value” in borderless production systems. For many economists, this entails the development of new methods for estimating the portion of “value-added” in a country’s gross trade values. In a world of vertical specialization, value-added is a more accurate measure of a country’s exports because a substantial portion of a country’s gross exports may include imported intermediate inputs, whether physical parts and components or business services, which are utilized in final goods (or more advanced intermediate goods) and then exported worldwide. By one estimation, as much as 28% of total world trade might be double counted in this way, and it is estimated that China’s trade surplus with the US would be substantially reduced when measured by value-added methods (UNCTAD,
Governed Trade – Mark P. Dallas

2013: 125; WTO and IDE-JETRO, 2011: 104). Economists and several international organizations have developed a range of estimation methods, in some cases by integrating national input-output tables with international trade data to estimate the value-added portion of a country’s exports (UNCTAD, 2013: 124).

Similarly, as the global value chain name suggests, the generation and capture of value is equally central to GVC literatures, except that techniques for quantification are more often located at the level of “business functions” (Brown, Sturgeon and Connor, 2013), or specific products such as Apple electronics, rather than aggregate trade flows (Dedrick, Kraemer and Linden, 2010). Unlike trade in value-added measures, however, there is no single, accepted standard among GVC scholars over how to conceptualize, define and measure value or its distribution between firms, though some scholars have proposed common standards (Kaplinsky and Morris, 2001), with relative profit rates and pricing between buyer and supplier firms common choices (Sturgeon and Lester, 2004).

Finally, both literatures share an interest in fragmented production’s effects on factors of production. The primary interests for trade economists are the effects of trade on employment, wages, labor of different skill levels, and inequality – the same concerns of “just trade” vertical specialization literatures. That said, there have been important refinements. For instance, some economists point out that trade in intermediate fragments has the special characteristic of generating productivity improvements akin to factor-improving technological change, meaning that contrary to the heated outsourcing debate, low-skilled laborers in advanced countries are the beneficiaries of low-skill outsourcing (Grossman and Rossi-Hansberg, 2008). Thus, in economics, the debate largely concerns the severity of the transitional costs and which segments of the labor force will carry the temporary burden – in other words, longstanding trade debates.
GVC scholars equally focus on the impact of fragmented production on factors of production. For instance, GVC research has long examined the opportunities and limitations of developing country firms in upgrading within fragmented production chains, with the implicit assumption that labor would benefit. However, in recent years, a new literature on social upgrading challenges the assumption that firm upgrading unproblematically implies benefits to labor (Barrientos, Gereffi and Rossi, 2011), even finding that firm upgrading can be associated with declining real wages (Milberg and Winkler, 2013).

How then do economic and GVC approaches differ? Most importantly, they differ over the status of firms, and it is precisely firm-level variation in trade transactions which this paper empirically evaluates. For “just trade” economists, the firm as a strategic decision-maker has little role because markets are assumed perfectly competitive. As such, the firm in most trade theory simply has “no freedom of action if it is to earn at least the opportunity cost of its investments. Its maximum and minimum profit positions are one and the same thing. However, once markets become imperfect…then strategy begins to play an active role in affecting business conduct” (Dunning and Lundan, 2008: 87). Furthermore, for trade theorists, industries or sectors are conceptualized as equivalent to tradable products, meaning that when a function which was previously conducted internal to a firm is externalized, it becomes a new tradable product and hence a new sector (in the spirit of Bhagwati, 1984). The logic of fragmentation for “just trade” economists is that each new slice of the production process that can be externalized becomes a tradable product like any other, and thus best located in countries with the most cost-efficient combination of factor endowments, trade and coordination costs and scale economies.

In recent years, however, new economics research has incorporated the role of firms and inter-firm relationships into trade theory. This originally began as empirical insights using
detailed firm-level data (Bernard and Jensen, 1995). This research found that trade is extremely concentrated at the firm-level, in that the vast majority of a country’s exports and imports is conducted by the largest 1% of firms, which are also the most productive firms that pay higher wages, are more skill-intensive and capital-intensive and more diversified as exporters (Bernard, Jensen, Redding and Schott, 2007). These insights have inspired a “firm heterogeneity” literature which has been formalized into important new trade theories that model previously unappreciated gains from trade through inter-firm resource allocations (Melitz, 2003), and even intra-firm reallocations (Bernard, Redding and Schott, 2011). In the empirical evaluations below, relevant branches of firm-centric literatures are considered.\(^4\)

While these firm-centric perspectives come much closer to GVC scholarship than “just trade” economics, they differ on key dimensions explored in this paper. Most importantly, firm heterogeneity literatures continue to assume perfectly competitive markets, meaning that even the largest, most productive 1% of traders engage in short-term cost-minimization behavior when making decisions over outsourcing, their product ranges and entering new markets.\(^5\) By extension, GVC scholarship differs in three interlinked ways: advancing a strategic role for firms, incorporating sector-specific organization and theorizing multiple types of outsourcing – including modular, relational and captive – which vary in the governance of buyer-supplier relationships. First, the firm as a strategic actor is a foundational concept that unites all GVC approaches to fragmentation. This means that firms develop long-term strategies which may contradict the short-term cost minimization/profit maximization strategy implicit in economic analyses. While GVC scholars do not begrudge a role for inter-country factor costs or trade and coordination costs, they consider a broader pallet of long and short-term strategic choices in firm decisions concerning outsourcing, investment locations, product choices or opening new
markets. The capacity for diverse firm strategies means that firms are not simply rankable by size or productivity (as in firm heterogeneity), but vary by type according to their roles in the broader industrial ecosystem, such as contract manufacturers or global buyers of various stripes.

Second, GVC scholars incorporate greater complexity in sectoral analysis, beyond differences in factor inputs, returns to scale or inter-firm non-contractibility. As discussed below, in GVCs, sectors categorically differ in sector-specific organization and technical characteristics. Finally, the combination of strategic firms and sector-specific dynamics lead to different types of inter-firm governance mechanisms, meaning that there are varieties in outsourcing with important theoretical and empirical implications. Thus, firms, sectors, inter-firm governance and outsourcing are variable and heterogeneous, with substantive importance for the division of value, and the well-being of labor and other production factors – issues of interest to both economists and GVC scholars.

If it is true that trade is powerfully shaped by variation in inter-firm governance, then evidence of this should be observable in firm-level transactional trade data. Through these data, this paper provides a large-scale and comparative evaluation of the export behavior of hundreds of China’s largest exporters within eighteen distinct but ‘nested’ sub-industries defined by detailed 4- and 6-digit Harmonized System (HS) codes, which broadly fall under the electronics and light industry categories. In general, the data lend support to GVC notions of heterogeneous governance in trade and among sectors. I turn next to an exposition of GVC theory in order then to generate specific hypotheses regarding how trade patterns are predicted to vary by inter-firm modes of governance.

II. A Theory of Global Value Chain Governance
While firm- and sector-level analyses are central to GVC approaches to fragmented production, not all of them aim to fashion causal theories. Among them, however, the syncretic article by Gereffi, Humphrey and Sturgeon (2005) on global value chains is one of the clearest theoretical statements which provides a framework for making descriptive and causal inferences. Theoretically drawing from transaction-cost economics, Penrose’s resources-based view of the firm and trust and embeddedness in sociology and geography, their GVC framework was preceded by three previous theory-building research projects: buyer and producer-driven commodity chains (Gereffi and Korzeniewicz, 1994), quasi-hierarchies in buyer-supplier ties (Humphrey and Schmitz, 2002) and modularity (Sturgeon, 2002). Consistent with GVC’s industry case study method, each research trajectory derived from in-depth studies of particular industries, including garments (Gereffi, 1999), footwear (Schmitz, 1999), horticulture (Dolan and Humphrey, 2000) and electronics (Sturgeon, 2002). Through this, the authors devised a new, syncretic theoretical statement that classifies inter-firm governance into five categories, each represented by model industries, which over time can transmute between governance modes.

According to this framework, there are three factors which shape inter-firm governance: complexity, codifiability and capabilities. The degree of complexity of transactions indicates the intensity and complexity of information and knowledge that must be communicated between firms to achieve joint production. Codifiability indicates how easily transactional complexity can be ‘codified’ (often digitally), and hence more easily transmitted between suppliers and buyers. And finally, the level of supplier firm capabilities indicates how well suppliers can handle joint tasks given the relative complexity of the transactions and the degree of codifiability. All variables are interactive, dynamic and hence inter-firm governance can change over time.
When combined, these three factors yield five viable governance mechanisms. Two of the five are the well-known, dichotomous “markets and hierarchies.” Pure markets involve arms-length transactions, with minimal information flows between parties and thus can only be used for transactionally and informationally simple exchanges. Buyers and sellers are many and can be easily substituted due to low switching costs. Hierarchies occur when transactions are complex and cannot be easily codified, and supplier capabilities are low, which incentivizes lead firms to internalize transactions, so long as asset specificity is present (following transaction-cost theory) and they have the technical competence to perform the function.

The authors also differentiate three intermediary forms of inter-firm governance – modular, relational and captive – which constitute the core of their theoretical contribution and illustrate the heterogeneity of inter-firm linkages. Modular linkages occur when complex, information-rich transactions can be codified and transmitted easily between buyer and suppliers, often through digitization, and suppliers have the capabilities to receive the technical transmissions and act appropriately. This means that despite the transactional complexity, firms can operate at relatively more arm’s-length and geographic distance because they do not have to exchange tacit information in order to transact. This high degree of codification and the creation of industry-wide standards allow suppliers to achieve both economies of scale and scope, as well as diversification across customers (Sturgeon, 2002).

A major differentiating quality of modularization compared to relational and captive linkages is its "emergent" qualities, in which common standards evolve and take hold at the industry-level, which allow firms great freedom to change partners, despite the high complexity of their transactions. On the one hand, modularity’s open industry standards and information codification offers unusual opportunities for new entrants; in turn, as new entrants adopt industry
standards, the standards are strengthened and consolidated. In combination, the consolidation of industry standards and openness to new entrants reduces power asymmetries between buyers and suppliers, and powerful firms have difficulty unilaterally altering the industrial system.

These factors are not true in relational and captive governance, which are similar in that they both rely on close, dyadic and particularistic ties between two firms, which stands in contrast to the industry-level ”emergence” of modularity. Relational and captive governance differ, however, in the type of explicit coordination conducted between suppliers and buyers, which has implications for the degree of power asymmetry between firms. “Captive” governance occurs when supplier capabilities are weak relative to the joint production task at hand, making it hard to convey complex instructions. Furthermore, codification either cannot be easily achieved (perhaps due to tacit knowledge requirements), and/or low supplier capabilities inhibit the learning of tacit knowledge, which (as the name suggests) can create a steep hierarchy between buyer and supplier.

By contrast, “relational” governance occurs when instructions are complex and also hard to codify, but suppliers are very capable. This allows the lead firms to create deep, more equal and mutually dependent relationships with their suppliers, with whom they can engage in very complex transactions. In relational and captive governance, lead firms sometimes actively assist their suppliers to upgrade into higher value functions, although in the case of captive governance, this is more in control of lead firms due to the greater power asymmetry.

Altogether, among the five governance types, only one involves internalization. The remaining four involve some type of inter-firm exchange relationship – in other words heterogeneity in trade. Is there consistent evidence of this heterogeneity in large-scale trade data?
III. From Governance Theory to Hypotheses

With clear differentiation across inter-firm governance mechanisms, hypotheses can be generated regarding supplier firm attributes and their conduct of trade across governance types and industries. Although GVC theory does not itself make the following predictions, this paper seeks to link GVC theory with new transactional trade data by formulating expected outcomes. The hypotheses are summarized in Table 1, along with measurement definitions, levels of analysis and some directly relevant economics literatures, which are further discussed below.

Among the governance modes, “hierarchy” is necessarily ignored because this article only concerns trade transactions between formally independent firms. In addition, I only distinguish three inter-firm governance mechanisms: modular, relational-captive and market ties.

Captive and relational ties are combined into a single category due to the limitations of Chinese transactional trade data. As mentioned, captive and relational networks are both driven by particularistic and dyadic relationships between buyers and suppliers, in contrast to the arm’s-length of markets and industry-wide standards of modularity. Unfortunately, the transactional trade data used in this paper have little leverage in differentiating the deep intimacy and relative equality of “relational” ties, from the relatively less intimate and more hierarchical nature of “captive” ties. These are characteristics of inter-firm relationships which are best studied through in-depth fieldwork and more refined survey data – traditional strengths of GVC research methodology. China’s transactional trade data cannot readily observe these subtle distinctions, though future research may be able to. 

Drawing from GVC theory, this article derives hypotheses along dimensions by which modular, relational-captive and market governance can be empirically measured and compared.
using transactional trade data. These include export specialization, transactional stability, product-level stability and export entry – all of which are equally studied in trade economics, except transactional stability (see Table 1).

Throughout the analysis, it should be kept in mind that it focuses only on China’s largest exporters. To be considered one of China’s elite exporters, a firm has to rank among the largest twenty-five exporters by export value in one of the eighteen sub-industries examined in this paper. This means that conclusions regarding inter-firm trade relationships may dramatically differ for small and medium enterprises (SMEs), even within identical sub-industries, let alone across industries. It should also be kept in mind that many variables important in trade theory, such as a product’s factor intensities, return to scale, trade costs, and so forth, are controlled for, given that we are examining a single country, only the very largest firms and very narrow product classifications (HS codes).

[Table 1]

The first dimension by which firms might are hypothesized to differ by mode of governance is the export specialization of supplier firms. This is calculated as the share of a firm’s total exports which derives from its primary HS codes, defined as the HS code for which it was listed as one of China’s largest exporters. While outcomes likely differ for SMEs, giant exporters that trade generic products in pure markets might be expected to be the least specialized in any single product line, and thus would be more likely to engage in product and industry diversification. This is because the best strategy for these very large firms in dealing with instability in market-based transacting is broad diversification, not only in terms of buyers,
but among product lines as well. In fact, large firms would do well to operate as intermediary or trading companies in order to capture the widest array of buyer contracts, mitigate market instability and maximize market breadth.

By contrast, because relational-captive ties between buyers and suppliers are much deeper and more complex, and entail greater sunk costs, exports should be more specialized. As the literature notes, these closer and more complex coordinated relationships require suppliers to concentrate firm resources on specialized products. For instance, “manufacturing to tight specifications for the main customers requires an internal organization geared to this purpose and builds up capabilities which are highly developed but narrow,” which *ceteris paribus* are more likely to limit avenues to diversify (Humphrey and Schmitz, 2002: 1024). Furthermore, given the more stable relationships built up with their closest buyers, suppliers are less likely to feel the urgency to diversify as widely, compared to industries in which pure market relationships prevail.

For modular networks, no single, clear outcome can be predicted for export specialization. This is because modular production simultaneously entails both very large economies of scale and economies of scope due to codification, industry standards and flexible and general but highly automated machinery (for instance in electronics). This is most pronounced when firms are located in so-called “base processes” or manufacture “base components” in the value chain, in which they can interchangeably service many customers across multiple industries (Sturgeon, 2002). This interchangeability often requires enormous economies of scale, which place limits on a firm’s economies of scope – countervailing forces which do not allow for a clear prediction, as indicated in Table 1.

The export specialization of firms is also an important concept in the economics literature on
multiproduct firms. For instance, economists have observed that the largest and most productive exporters are more likely to export many products to many countries. In one study, the largest 12% of US exporters export five or more products to five or more countries, and they collectively employ 69% of the workers among exporters. By contrast 42% of exporters export no more than one product, and employed only 7% (Bernard, Jensen, Redding and Schott, 2007). Thus, the literature argues that the largest exporters will also be the most diversified firms and so it predicts convergence among the largest firms. By contrast, the GVC hypotheses derived above predict that export specialization will be heterogeneous across governance forms, even among the very largest firms.

A second point of predicted differentiation between GVC governance modes is the transactional stability of a firm’s exports to its buyers – an issue central to questions of “flexibility” in production and labor management. Using transactional trade data, this concept is measured as the coefficient of variation (CoV) of a firm’s monthly transactions within its primary HS category – that is, the category in which it ranks among the largest twenty-five exporters. By measuring the CoV within a firms’ primary HS code (rather than across all of its HS codes), it ensures that our measure of a firm’s export diversification remains distinct from results for its transactional stability. Thus, I measure here the trade relationship with foreign buyers within the primary product, regardless of the degree of diversification of the overall firm (export specialization). The coefficient of variation (as opposed to the standard deviation) is used to allow comparison across industries, because it is not sensitive to the absolute quantity of the monthly transactions, which is much larger in electronics than light industries.

On the one hand, modularity is specifically equipped to absorb transactional instability. As mentioned, firms with modular linkages are likely to maintain relationships with multiple buyers
across multiple products, achieving both economies of scale and scope. Thus, even if the overall industry is extraordinarily unstable (discussed next), or even if any particular buyer is erratic in its purchases, the supplier’s record of transactions is predicted to be relatively more stable as economies of scope and buyer diversification work to even out industry-level or other sources of transactional volatility. Transactional stability might be especially evident for electronics firms engaged in production of “base products,” in that they can find a market across a wider range of usages and customers.

At the other extreme, one would expect that pure markets would have the least stable contracting relationships, given the very low switching costs, which is the very definition of pure market relationships. This volatility may contribute to why they are also more likely to have the greatest product diversification (lowest export specialization), as mentioned earlier. In between these extremes, one would expect to fall relational-captive governance. While they too lack the degree of built-in economies of scope and diversification enabled by modular linkages, the deeper ties between buyers and suppliers suggest additional sunk costs and investments for both parties, resulting in higher switching costs. This suggests that transacting in relational-captive governance should be less volatile than in pure market relationships, but more volatile than in modularity.

Third, and related to transactional stability, is product-level stability. If the former concerns the capacity of supplier firms to absorb transactional volatility, trade in entire product categories in aggregate might also be expected to vary. Product stability is proxied using inflation-adjusted and trade-weighted UN Comtrade annual export data using China as the reporter of exports to the USA, Japan and Hong Kong, during the “crisis” years of 2007 to 2012, and using the EU as the reporter for imports from China for the same time period. Only years registering a real
decline in Chinese exports in the HS code are included. The logic is that years of declining exports pose serious competitive strains on suppliers, whereas years of expanding exports are more easily enjoyed by all.

Contrary to firm-level predictions of relative transactional stability, modular value chains at the aggregate product-level are expected to be highly volatile, especially for final goods, where there is a complex circular causality between consumer demand, branded firms and contract manufacturers. First, consumer demand is less stable in an industry like electronics, which moves both seasonally and with the release of popular new products, compared to light industry consumer staples. However, on the supply-side, volatility is also built into the modular value chain itself. One of the benefits of modular production for global buyers is that “by using contract manufacturers, brand-name firms gain the ability to ramp the volume of their production upward or downward on short notice, without the need to install or idle in-house plant and equipment” (Sturgeon, 2002: 462). These virtues of modular value chains empower branded electronics firms (the buyers) to adjust physical production volumes at little cost to themselves, by pushing volatility down the value chain to all of their suppliers. Furthermore, industries with modular value chains are generally more concentrated with fewer but much larger firms, in which changes initiated by large buyers, who transact in large quantities with large suppliers can create sudden swings in production, all geared towards supplying unstable consumer demand. Finally, the economies of scope enjoyed by giant contract manufacturers collectively allow the industry to satisfy volatile demand as contracts are spread across suppliers. Thus, there are many, mutually reinforcing causes of high industry volatility in modular value chains, including consumer demand, production organization, industrial concentration, and economies of scale and scope. These are intimately intertwined, creating a modular value chain “system” of production
and trade. Anecdotally, this is well illustrated by the massive, sudden and secretive product launches orchestrated by Apple and Samsung in smartphones, or Sony and Microsoft in video game consoles.

By contrast, relational-captive and market-oriented governance lack these built-in supply-side characteristics and degree of industry concentration, at least in the light industries studied here. Add to this that they are consumer staples with lower price elasticities, and it should be the case that they are more stable at the product-level than electronics. When comparing relational-captive with pure market governance, however, there are no supply-side factors to differentiate them at the aggregate industry-level, so the prediction is rather simple: their industry stability should both be higher than modularity, but relatively similar between pure market and relational-captive. This means that even though individual firms in market and relational-captive linkages struggle with transactional volatility with their buyers (though, as predicted, more so in markets than relational-captive), trade across the aggregate product or sub-industry classification remains relatively more stable, compared to modularity.

Thus, in terms of the two types of “stability,” we should find roughly opposite results at the product versus firm levels. As the exemplar of modularity, electronics value chains are expected to experience the greatest volatility at the product level, but simultaneously the least amount of firm-level volatility due to the firm’s capacity to absorb volatility. By contrast, one would expect greater stability in governance channels dominated by market and relational-captive transacting, while firm-level transactional volatility should be much higher, and more so in unstable markets than relational-captive governance. Given that stability at these two levels of analysis would normally be expected to be positively correlated – greater product-level stability should foster firm-level transactional stability – if they prove to be inversely correlated as predicted, then this
would offer strong empirical support of the impact of inter-firm governance on the conduct of trade.

Volatility is a topic of interest in trade literatures, as well. While much of it concerns inter-country synchronization of business cycles through trade, there has been some work specifically on the relationship between volatility and offshoring. For instance, Bergin, Feenstra and Hanson (2009, 2011) find much higher monthly volatility in employment in offshored Mexican \textit{maquiladora} industries than the same non-offshored industries located across the border in the U.S. However, the authors restrict their analysis by comparing offshored and non-offshored segments of the same industries. By contrast, this article predicts differences in volatility \textit{within} the offshored segments of different industries. Intriguingly, however, their industry-level results support this paper’s predicted findings – (modular) electronics exhibited by far the highest level of industry-level volatility (using 3-digit NAICS codes), compared to apparel, electric machinery and transportation equipment.

Finally, GVC governance predicts heterogeneity in the barriers to \textit{export market entry} – even within light industries. This paper uses the share of total exports by HS code which is conducted by foreign-invested firms (FIEs) as a proxy of export entry. FIEs are used as a proxy because it is well-known that they occupy a dominant position in Chinese exports, and sales into international markets generally indicate world-class capabilities. For instance, starting from 1991, FIEs’ share of China’s total exports rose from 17% to close to 60% in the 2000s (State Statistical Bureau, various issues), with even higher rates in electronics, indicative of their competitiveness in China’s export sector.

There are two relevant literatures to compare with GVC predictions on the issue of export entry barriers. First, the “firm heterogeneity” literature predicts that the largest and most
productive firms should be most capable of affording the fixed costs required of export entry. Given that our sample already controls for firm size, the “firm heterogeneity” literature would predict little variation, especially across narrow sub-industries like light industries. Second, theories of MNEs predict that compared to other industries, light industries should exhibit the lowest levels of foreign ownership and little variance across sub-industries. This is because light industries are technologically simple, production technology is cheap and easily purchased, and knowledge and skills are widespread. Since foreign firms are assumed to possess disadvantages when investing in a foreign country, they must possess internal ownership advantages to overcome the home-court advantages of native firms, and light industries have some of the lowest entry barriers (Dunning and Lundan, 2008). As such, Caves (2007: 30-31) concludes that “MNEs are logically incompatible with purely competitive organization of an industry,” and light industries come closest to this pure market ideal – evidenced by the tens of thousands of competing firms in China’s light industries. Thus, these literatures would predict little heterogeneity across related sub-sectors, and particularly low levels of foreign ownership in light industries overall (see Dallas 2014a).

By contrast, GVC theory predicts heterogeneity, even between light industries. On the one hand, modular value chain linkages are predicted to create the highest export barriers, given the high capital costs and range of capabilities needed to achieve the economies of scale and scope and buyer diversification. However, this prediction is theoretically uninteresting because of so many other confounding factors, like technology and know-how which already give FIEs an advantage. Thus, this paper focuses only on predicted variance in market and relational-captive ties among the ten light industries.

Given the low switching costs, simplicity of transactions, and general openness, market
governance should have the lowest barriers to export entry and hence the smallest presence of FIEs. By contrast, relational-captive governance should create higher barriers to exporting because it requires expensive and time-consuming relationships with buyers that entail mutual sunk costs (asset specificity). Furthermore, relational ties require high supplier capabilities (though captive ones do not). Nonetheless, altogether relational-captive linkages entail higher barriers compared to market governance. Do transactional trade data restricted to just light industries reveal distinct market and relational-captive channels in export entry? Having derived hypotheses based on the theoretical literature, we turn to an evaluation of the data.

IV. An Analysis of Transactional Trade Data

Table 2 summarizes the eighteen sub-industries organized by HS code and examined in this paper – eight electronics industries represented by 190 establishments and ten light industries with 249 establishments – China’s largest export sectors. The establishments were ranked by export revenue according to the HS codes in Table 2, and the largest twenty-five were selected from data for 2011 and 2012. Some industries have fewer than twenty-five firms due to critical missing transactional data. Data on each firm was used to make the calculations in Table 1. In the figures below, the firm-level data were averaged according to the firm’s export weight for each sub-sector or by ownership (foreign and domestic). FIEs include wholly-owned, equity and contractual joint ventures, while domestic firms constitute the remainder. Altogether, the eighteen sub-sectors at 4-digit and 6-digit HS codes constitute 31.3% of China’s total exports in 2012, with $429 billion deriving from the electronics sectors and $212 billion from the light industry sectors – very large shares considering the thousands of HS codes within which a large country like China trades (UN Comtrade).
Overall, the data align well with predictions. This is particularly the case for the electronics sub-industries, which show small variance among each other in the measures used in this paper, while also being quite distinct from the light industries. In other words, they appear to operate as a world onto their own, governed in predictable ways by the mechanics of value chain modularity.

By contrast, light industries show stark bifurcation between market and relational-captive linkages (even within detailed 6-digit HS levels). As the data below illustrate, this is because most of the light industries are differentiated along ownership lines. FIEs located in China are far more likely to exhibit characteristics associated with relational-captive governance (e.g. high levels of specialization, high levels of transactional stability), while domestic firms in the same sub-industries exhibit pure market relationships with buyers (e.g. low specialization, low transactional stability). This implies that China’s elite group of exporters in light industries are highly “channelized,” meaning that in each sub-industry, one channel of exports is dominated by FIEs which enjoy deeper and more stable relations with their buyers (relational-captive), while domestic firms lack deep linkages with buyers and compete within the unstable world of pure market channels. As discussed later, this observation requires a theory of the firm, which considers the firm capabilities and resources that differentiate foreign and Chinese firms.

[Table 2]

This relational-captive and market channelization in light industries is extremely pronounced in six out of the ten light industries studied, including footwear, toys, wool and silk garments, men’s and boy’s (M&B) cotton garments and cotton textile goods sectors. It is also evident in
furniture and women’s and girl’s (W&G) cotton garments, though less pronounced. The only light industries which do not appear channelized, in that both foreign and domestic firms appear to exhibit common trade behavior are synthetic garments (both M&B and W&G), which consistently exhibit the most market-governed characteristics (discussed later). Thus, there is wide variation in governance mechanisms even among the elite exporters and within just the garment sector of a single country – such as, between specialty fibers (wool and silk) and cheaper, conventional fibers (synthetic), as well as within any single sub-industry which are bifurcated into relational-captive and market channels. Distinct market and relational-captive channels, even within a single industry may not be an unusual finding given the possibility of variance between large and small firms. But this study focuses only on the most elite group of Chinese exporters, and both the firm heterogeneity literature and GVC case studies find that “giant” suppliers are distinctive, even in normally footloose light industries (Dolan and Humphrey, 2000, Appelbaum, 2008).

The next three sub-sections examine measures of inter-firm governance using transactional trade data, including: export entry, export specialization, and industrial and transactional stability.

(a) Export Entry

As mentioned, while it is impossible to determine the precise contribution of modularity, it is no surprise that export entry is extremely difficult across all eight electronics sub-industries, where foreign firms are overwhelmingly dominant, never taking less than 80% of export shares. However, contrary to MNE theory, even some light industries have very high levels of foreign ownership, while others are domestic firm-dominated, creating wide variance across light industries. In four sub-industries (toys, furniture and silk and wool garments), FIEs continue to
dominate over 70% of the export market share among the elite firms, and in the latter two industries, these largest firms (out of thousands of total firms) account for 43% and 25% of China’s total exports.

Thus, despite being light industries with the lowest entry barriers, these sub-industries exhibit very high export barriers, in which domestic firms appear handicapped in entering export “channels” dominated by FIEs. While not direct proof that FIEs enjoy relational-captive ties with buyers, it is suggestive of this possibility, especially when considered in conjunction with the remaining results, below.

[Figure 1]

At the opposite end of the spectrum, domestic exporters dominate 72% to 85% of the export share in four cotton and synthetic fiber garment sub-industries. The low barrier to entry for domestic firms is what theory would normally expect across all light industries. Thus, among all ten light sub-industries, there exists a genuine mixture of domestic and foreign firms in only two industries – footwear and M&B cotton garments (Figure 1).

However, even the relative parity in footwear and M&B cotton garments is partly a mirage. When the trade data are examined at more refined 4- and 6-digit levels respectively, the disaggregated data reveal wide variance – further indication of channelized trade by governance. For instance, foreign firms dominate 75% of M&B cotton woven shirts (HS Code 620520) led by Hong Kong companies like Esquel, compared to an average of only 24% in all of the remaining M&B cotton sub-categories. Similarly, foreign firms are more concentrated in leather shoes (HS Code 6403) with 52% of export market share, compared to an average 31% in the remaining
shoe categories. Thus, using even more refined transactional data, the exceptions prove the rule, in that foreign and domestic firms occupy distinct niches with different export barriers, even across nearly identical sub-industries and among the largest firms.

As mentioned, firm heterogeneity literatures would predict little variance across the largest firms and MNE theory normally predicts little foreign ownership in more purely competitive industries, like light industries. However, transactional trade data exhibit an extraordinary degree of sub-sectoral variation, and offer our first clues of distinct trade “channels” governed by relational-captive ties and market ties, with FIEs more likely in the former and domestic firms the latter. Furthermore, this shows that even commonly studied GVC industrial categories, like garments and footwear, may be too broad and may require disaggregation to identify relevant governance mechanisms. All of these points are further reinforced in the remaining data.

(b) Export Specialization

Barriers to exporting alone are a relatively crude measure of differentiation across governance mechanisms. Do other predictions also hold? For export specialization, we anticipated that the strategies of firms within pure market channels would be best served by minimizing specialization (like a trading company), given the very easy switching costs endemic to pure markets. Relational-captive governance should be much more specialized because supplier-buyer relationships involve greater sunk costs, are longer term and more stable, and thus require greater resource concentration on a narrower set of product categories. Expectations for modularity were not hypothesized given the countervailing forces of economies of scale and scope.11

As expected, among light industries, the two synthetic fiber garment industries which were
previously identified as indicative of pure markets, were also the least specialized overall, with less than 30% of their exports derived from synthetic garments. However, similar to what was found for export barriers, most of the remaining light industries appeared to be highly ‘channelized’ – with FIEs exhibiting characteristics of relational-captive ties, and domestic firms confined to market governance. Indeed, in all ten light industries, FIEs are more specialized than domestic firms, and in all of these light industries except for furniture, the difference between foreign and domestic firms is very pronounced. Comparing within identical light industries, domestic firms generally export no more than 30% within their primary product categories, whereas FIEs average around 70% specialization – an enormous gap given that country and sub-industry are both controlled for (Figure 2). One anomaly, however, is the silk garment sector, which is also not specialized despite foreign dominance. One possible explanation is that silk is the smallest sector by value and firms may require minimum economies of scales in exporting.

[Figure 2]

The lack of specialization among domestic firms is partly because many of them indeed are intermediary trading companies, reinforcing the notion that their ties with buyers are market-governed. The corporate names of many domestic Chinese exporters in light industries reveal their status as commercial traders, not direct producers. These include common Chinese commercial titles, such as “import and export company” (jinchukou gongsi), or “trading company” (maoyi gongsi), often accompanied by a provincial or city name (the state- or former state-owners of the trading company).

As discussed earlier, economics research on multiproduct firms (MPFs) would not predict
such wide variance in export specialization among China’s very largest exporters, especially within identical products. Rather, it would predict *convergence* in export diversification among the largest firms. Specifically, for the large and highly competitive FIEs in this sample, the MPF literature would find their high degree of specialization in narrow HS codes quite anomalous because in MPF research, the largest and most competitive firms are more likely also to be diversified, while the smaller and least productive exporters have the narrowest product ranges. The heterogeneity found in Chinese data further reinforces the salience of GVC-governed trade.

### (c) Transactional and Industrial Stability

The remaining two comparisons of governance mechanisms concern transactional stability (firm-level monthly variance in export order size) and product stability (product-level declines in annual Chinese exports). It was hypothesized that if governance mechanisms were consequential in shaping trade behavior, then firm-level transactional stability and product-level stability would be *inversely* correlated – a prediction that runs contrary to what one would normally expect, in which product stability might be reflected in firm-level transactional stability.

The data correspond closely with the predictions of “governed” trade. As expected, product-level stability is higher in light industries, where the inflation-adjusted, trade-weighted year-on-year average decline in exports from China to its largest export markets (US, Japan, Europe and Hong Kong) was -10.3%, between 2007 and 2012, ranging between -6.6% to a maximum of -14.3%. By contrast, the eight electronics industries averaged -14.8%, a 44% gap with the light industries average (Figure 3). A similar gap between electronics and apparel was also found in Bergin, Feenstra and Hanson’s (2009, 2011) findings in Mexican *maquiladora*. 
However, the electronics industry’s average of -14.8% hides substantial variation within sub-sectors. For instance, final good electronics like computers, laptops, phones, televisions, among others, averaged -20.1% annual declines, while those in upstream, intermediate inputs, like integrated circuits, printed circuit boards, computer and audio-video components averaged only -11.7% declines. This fits with our prediction that the greatest volatility derives from the circular causality between the supply- and demand-sides in modular value chains, which influences the buying practices of branded electronics buyers of final goods, who ultimately impose extraordinary production flexibility onto contract manufacturers. By contrast, electronic parts and components are more often generic “base products” that can find a market across any number of unrelated industries, beyond electronics.

By contrast, at the firm-level, we find just the opposite ranking of stability. Transactional stability is measured by the coefficient of variation (CoV) of a firm’s total monthly transactions from January 2011 to June 2013 (30 months) in which a higher CoV indicates greater transactional volatility, while a lower CoV indicates transactional stability. The CoV is not sensitive to the size of transactions, and so the much larger electronics transactions can be compared with light industries.

In spite of the much higher volatility in the trade of electronic products overall, its largest firms indeed appear to absorb this volatility through economies of scope and buyer diversification. In the aggregate, the firms in the eight electronics sub-industries averaged 0.45 (Figure 4). This is significantly more stable than light industries which average 0.63 overall, and if the highly volatile synthetic fiber garments are excluded, they still average 0.56, which
respectively are 40% and 27% higher than the electronics industry average. In fact, the only electronics sub-sector which exceeds 0.50 is integrated circuits and this is due to the uncharacteristically large gap between the fifteen foreign firms (0.43) and five domestic firms (1.47) in the sample. Furthermore, computers (0.43), phones (0.46) and TVs and monitors (0.47) – our three electronics final goods sub-sectors – exhibit very low transactional volatility in spite of the fact that they recorded the very highest product-level volatility, precisely the inverse relationship we expected of modular value chains.

[Figure 4]

However, again, variation within light industries is perhaps more insightful, given the many factors that differentiate light industries and electronics. Nevertheless, light industry predictions also hold well. For instance, the only two sub-sectors which have been consistently identified as market-oriented (M&B and W&G synthetic garments) predictably experienced the very highest degree of firm-level transactional volatility among all eighteen sub-industries, averaging 0.85 and 0.98, respectively. The remaining light industries experienced significantly lower levels of volatility overall. More intriguing, however, is that within sub-industries, trade was “channelized” between the relational-captive ties of FIEs and the market-governed domestic firms. In every light industry, FIEs experienced more stable transacting relationships with their foreign buyers compared to domestic firms. Excluding the marketized synthetic fiber sectors, the average CoV among FIEs was 0.47, compared to an average of 0.64 among domestic firms, a 36% gap.

In terms of economics literature on volatility and offshoring, the wide gap within narrow sub-industries does not in itself contradict existing research; however, it does suggest that
existing studies would do well to dig deeper into sub-industry data. As mentioned, Bergin, Feenstra and Hanson (2009, 2011) find employment in offshored fragments of industries much more volatile than the same industries’ non-offshored fragments. However, this paper’s data suggest that there is substantial variance between trade channels within a single industry, like sub-industrial garment channels, and this depends on the nature of inter-firm governance.

For a final piece of evidence on the distinct channelization of light industries, Figure 5 combines this paper’s two firm-level indicators (transactional stability and export specialization) for all ten light industries (249 firms), but this time without taking sub-industry averages. It highlights most clearly the stark bifurcation in trade channels occupied by foreign and domestic firms. Using a coefficient of variation of 0.5 or less as a threshold for firms which enjoy the most stable transactional relationship with their buyers, 60.2% of FIEs enjoy such stable transacting, while only 30.9% of domestic firms do. Similarly, using a threshold of 70% or more for the most highly specialized exporters, 67.3% of FIEs are highly specialized, while only 23.3% of domestic firms are. These very large gaps reinforce our impression of the channelization of light industries in which most FIEs exhibit traits characteristic of relational-captive export ties with their foreign buyers, and most domestic firms exhibit traits characteristic of pure market channels.

[Figure 5]

A final word is in order on what might constitute a more complete explanation for these stark differences between foreign and domestic firms (and potentially between large firms and SMEs, in future research) – namely, firm-level dynamic capabilities. Especially within narrow light sub-industries (like men’s cotton shirts), typical FIE ownership advantages like physical
assets, technology or labor skills are much less important as differentiating factors between firms. Rather, the channelization observed here likely derives first, from firm advantages in acquiring “international knowledge and experience…a valuable, unique and hard to imitate resource” that is accumulated over time by working with large international buyers (Peng, 2001:820); and second, international buyers have transferred more responsibilities to their long-standing suppliers (Gereffi, 1999), such as design, material sourcing and logistics in an industry that demands rapid replenishment in fast fashion products. In contrast to common perceptions of light industries as “footloose,” channelization is likely to persist over time because firm capabilities, learning and integration with global buyers is path dependent in their accumulation, and there very well may be “higher order organizing principles” for firms in the exploitation of this knowledge (Kogut and Zander, 1993). Thus, despite the relative simplicity of light industry manufacturing, channelization can be self-reinforcing and endemic through a vicious circle: domestic firms are rarely invited into relational-captive channels because they lack the capabilities and trust of foreign buyers; and they lack the capabilities and trust of buyers because they are never invited into relational-captive channels. Thus, domestic firms never benefit from the “ratchet effect” and co-evolutionary capability-building discussed earlier, thus perpetuating the continuity of channelized trade, even in simple light industries.

V. Conclusions and Future Research

The GVC literature has developed largely through qualitative case studies of firms and industries, uncovering much empirical richness and developing novel theoretical insights. However, they are also plagued by selection bias and struggle with generalizability. This paper utilizes transactional trade data as a new and fruitful source of data both to develop new
measurements previously not considered by GVC research, and to test hypotheses regarding existing GVC theory. Even with a highly restricted firm sample in terms of firm size, country, and detailed HS product codes which control for common trade determinants like factor intensities, trade costs and returns to scale, the paper finds wide variation in the conduct of trade among almost identically-situated firms. While any single prediction may be individually uninteresting, transactional trade data consistently support hypotheses concerning different inter-firm governance mechanisms which create heterogeneity in the conduct of trade. Altogether, they suggest that sector-specific organization and the specific value chain strategies of firms are powerful independent drivers of trade patterns, not just epiphenomena of broad market forces. Furthermore, it illustrates that GVC researchers can profitably advance their theories through large-scale quantitative data sources, like transactional trade data, and IPE scholarship in general would do well to consider powerful transnational firms as partially “governing” the international economy.

This result both complements and urges forward various firm-centric trade theories. In firm heterogeneity and multiproduct firm literatures, the size of firms and their productivity are seen as the primary drivers of export entry, export specialization, market diversity and other patterns of trade. By contrast, in this paper with firm size controlled for, export entry and export specialization exhibit wide variance in ways that are suggestive of differentiation in GVC governance and sub-industry “channels” that link suppliers and buyers. Thus, firms vary not simply by degrees along continua like size and productivity, but they also vary categorically by distinct governance mechanisms, creating even greater heterogeneity than these literatures have already uncovered. This also means that GVC researchers should be careful not to make premature assumptions about the distinctiveness of large firms as a group.
However, as an initial and exploratory examination of transactional trade data, the measures still remain crude, conclusions only suggestive and caveats important. One limitation is the data lack a full picture of ownership in that a single corporation may have additional exporting units that are not observed in the largest twenty-five exporters. Thus, the data miss the way firms might shift their orders between units. This would require both complete ownership data and comprehensive transactional trade data which are unavailable for this paper, but constitute possible areas for future research and testing. Nevertheless, in six of the eight electronics sub-sectors (and one light industry even), the largest twenty-five establishments captured between 40% and 65% of China’s total exports in their HS codes in the period 2011-12, illustrating that in these cases, the results are broadly indicative of Chinese trade patterns even without the full ownership picture.

Second, HS codes, even when disaggregated to the 6-digit level, still may possess substantial internal product diversity and this often varies unsystematically between codes. Thus, export specialization as measured here may be imprecise given the possibility of product variety within HS codes. That said, the Harmonized System of classification and these HS codes are the same instruments used in firm heterogeneity and multiproduct firm literatures, thus it is hard to avoid this problem when using any trade data. Furthermore, the intra-product differences found in this paper, such as between foreign and domestic firms, are not affected, since identical HS codes are analyzed.

Third, it is likely that Chinese and broader East Asian trade patterns may be exceptional in various ways, and so researchers who are already sensitive to geographic and institutional variance, would do well to explore the transactional trade data of other countries. Fortunately, these data are available across different countries (see footnote 2), including the US (Dallas
2014a), and their contents vary widely and are sufficiently malleable to explore a wider range of trade heterogeneity – all fruitful possibilities for future research.

If trade is “governed” by powerful lead firms and channelized within exclusive buyer-supplier relationships, then research on developing countries and export-oriented development should systematically incorporate the role of transnational enterprises into their analyses. International trade should not be thought of as undifferentiated, actorless markets in which firms are epiphenomenal price-takers and policy prescriptions are uniform. Rather, heterogeneous and firm-governed trade requires heterogeneous policy responses. If trade consists of distinct channels of exchange, then each channel potentially requires a different policy response, including trade and investment policies, assistance for firm upgrading and distinct industrial policies. This means that more attention should be devoted to studying the organization of the international economy, instead of reducing it to undifferentiated “flows” of resources, measured by inter-country trade, FDI and other resource flows. Consistent patterns of firm and sectoral governance in international trade have national development implications – an insight which complements recent “systemic” approaches to international political economy (Oatley 2011), but from a firm-centered perspective.

As a final word, the paper partly tempers optimism regarding the benefits of fragmented production, at least for China. In terms of employment, foreign exchange and aggregate growth, China certainly has benefited from its entry into fragments of borderless production systems. However, much of this has been enabled by FIEs, which remain dominant across twelve of this paper’s eighteen industries, including many light industries in which Chinese domestic firms ought to be competitive after more than thirty years of experience in international trade and in the technologically simplest light industries (Dallas 2014a, 2014b). Furthermore, domestic firms
are most commonly channelized into market-governed ties with buyers, which are the most volatile at the firm level, incentivize diversification over specialization, and have the lowest requirements for buyers to engage in supplier upgrading. This means that even beyond high-tech industries, China’s export-led manufacturing strength heavily relies on governance channels opened by FIEs. As labor or currency conditions change, FIEs likely have greater latitude to depart China than domestic firms, and given that their relational-captive ties with global buyers have been built up through co-evolutionary learning and capability-building, these buyer-supplier linkages are less likely to be severed, such that wherever the FIEs go, the buyers are likely to follow, and vice versa. Thus, despite the rhetoric of China’s rapid development and manufacturing prowess, in the realm of exports, China’s development is perhaps less autochthonous and less secure than presumed, which makes reversal of fortunes more possible, though hardly inevitable.
NOTES

1 Under the broader GVC rubric, I include literatures on global commodity chains (GCC) (Gereffi and Korzeniewicz 1994), global value chains (GVC) (Gereffi, Humphrey and Sturgeon 2005) and global production networks (GPN) of the Manchester school (Coe, Dicken and Hess 2008) as well as in technology and knowledge diffusion (Ernst and Kim 2002), four distinct approaches in active dialogue with each other.

2 There are many commercial sources to acquire transactional trade data, though they differ widely in content, quality and cost. For US data, PIERS is the gold standard, but other companies, such as Panjiva, Datamyne, Import Genius and others, also sell data (see Dallas 2014a). This paper uses Panjiva data. However, for comprehensive and raw transactional trade data of many other countries – meaning they are not mediated through a third-party commercial entity, see www.impexp.com and for China only, see www.e-to-china.com.

3 However, a class of “global suppliers,” which follow lead firms wherever they go, can also lower barriers to entry for countries, but they pose a new competitive dimension to local suppliers (Sturgeon and Lester 2004, Appelbaum 2008).

4 Another firm-centric trade literature which is relevant but not directly examined in this paper considers the effects on trade of the relationship between suppliers and headquarter (HQ) firms, especially when “relationship-specific investments” (RSI) are required between them. Using various measures of RSI, empirical tests show that an increase in RSI is associated with increased outsourcing; in other words, better contractibility between firms leads to more HQ internalization – a result contrary to standard transaction cost predictions (Antras 2014, Nunn and Trefler 2013).

5 Furthermore, the property rights approach described in footnote 4 differs because it is largely concerned with defining the boundaries of firms, meaning that their dependent variables are dichotomous – either internalization or arm’s-length outsourcing.

6 For another perspective on “emergence” in GVC, see Dallas 2014b.

7 Countries record transactional trade in very different ways, by including different firm-level and transactional variables, which could potentially differentiate relational from captive linkages.

8 Of course, each HS code contains multiple products, thus product diversification is possible within HS codes also.

9 EU reported data is used because China does not report trade transactions to the EU using disaggregated HS codes. China’s producer price index is used as the closest approximation for ex-factory inflation.

10 China uses a more conservative threshold of 25% equity for a firm to be considered an FIE. International standards are 10%.

11 Although no predictions were made for modularity, specialization is very high, averaging between 65% and nearly 90% for six of the sub-sectors, much higher than the averages of light industries. The only two exceptions are the computer parts and audio-video parts sectors.

12 Video game consoles (HS Code 9504 were equally volatile with a -25.8% average. Unfortunately, the transactional data were not complete enough to be included.
REFERENCES


# TABLES

Table 1: Summary of Hypotheses by Mode of Governance and Measurements

<table>
<thead>
<tr>
<th>Level of Analysis</th>
<th>Mode of Governance</th>
<th>Measurement</th>
<th>Relevant Economics Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Specialization</td>
<td>Firm</td>
<td>No Clear Prediction</td>
<td>High</td>
</tr>
<tr>
<td>Transaction Stability</td>
<td>Firm</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Industry Stability</td>
<td>Product</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Export Entry</td>
<td>Product</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>
## Table 2: Summary of Light Industry and Electronics Sub-industries

<table>
<thead>
<tr>
<th>Industry Name</th>
<th>Total Firms</th>
<th>Foreign Firms</th>
<th>Domestic Firms</th>
<th>Harmonized System Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Garments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton (M&amp;B)</td>
<td>24</td>
<td>10</td>
<td>14</td>
<td>620112*, 620192*, 620232*, 620332*, 620342*, 620352*, 620711*, 620721*, 620791*, 621193*</td>
</tr>
<tr>
<td>Cotton (W&amp;G)</td>
<td>25</td>
<td>7</td>
<td>18</td>
<td>620212*, 620292*, 620412*, 620422*, 620432*, 620442*, 620452*, 620462*, 620630*, 620821*, 620891*, 621142*</td>
</tr>
<tr>
<td>Synthetic Fibers (M&amp;B)</td>
<td>25</td>
<td>5</td>
<td>20</td>
<td>620113*, 620193*, 620212*, 620332*, 620343*, 620353*, 620722*, 621120*, 621111*, 621133*</td>
</tr>
<tr>
<td>Silk (All)</td>
<td>25</td>
<td>17</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>Non-Garment Light Industries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footwear</td>
<td>25</td>
<td>12</td>
<td>13</td>
<td>6401*, 6402*, 6403*, 6404*, 6405*, 6406*</td>
</tr>
<tr>
<td>Toys</td>
<td>25</td>
<td>18</td>
<td>7</td>
<td>9501*, 9502*, 9503*, 9504*, 9505*, 9506*</td>
</tr>
<tr>
<td>Furniture</td>
<td>25</td>
<td>17</td>
<td>8</td>
<td>9401*, 9402*, 9403*, 9404*, 9405*, 9406*</td>
</tr>
<tr>
<td><strong>Electronics: Final Products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computers</td>
<td>24</td>
<td>24</td>
<td>0</td>
<td>8471* Computers (automatic data processing machine)</td>
</tr>
<tr>
<td>Phones</td>
<td>24</td>
<td>21</td>
<td>3</td>
<td>8517* Land phones, mobile phones, faxes</td>
</tr>
<tr>
<td>TVs, Monitors</td>
<td>25</td>
<td>19</td>
<td>6</td>
<td>8528* TVs, monitors, video projectors</td>
</tr>
<tr>
<td><strong>Electronics: Intermediate Products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printed Circuits</td>
<td>25</td>
<td>24</td>
<td>1</td>
<td>8534* Printed circuits</td>
</tr>
<tr>
<td>Integrated Circuits</td>
<td>20</td>
<td>15</td>
<td>5</td>
<td>8542* Integrated circuits and microassemblies</td>
</tr>
<tr>
<td>LCDs, Optical App.</td>
<td>25</td>
<td>25</td>
<td>0</td>
<td>9013* Liquid crystal devices, lasers, optical appliances</td>
</tr>
<tr>
<td>Computer Parts</td>
<td>23</td>
<td>21</td>
<td>2</td>
<td>8473* Office machine and computer parts</td>
</tr>
<tr>
<td>Audio-Video Parts</td>
<td>24</td>
<td>23</td>
<td>1</td>
<td>8529* Parts, components for all audio and video equipment</td>
</tr>
<tr>
<td><strong>Total Light Industries</strong></td>
<td>249</td>
<td>113</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td><strong>Total Electronics</strong></td>
<td>190</td>
<td>172</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>439</td>
<td>285</td>
<td>154</td>
<td></td>
</tr>
</tbody>
</table>

Notes: M&B and W&G refer to Men & Boys and Women & Girls garment categories, respectively. The asterisks following the HS codes indicate that all HS codes more refined than the one listed are included in the category. For instance, 4-digit HS codes with an asterisk include all 6-digit and 8-digit sub-categories. For electronics, the industry name is a simplification of the descriptive category which is more fully described under the HS Code heading.
FIGURES

Figure 1. Export Entry: Foreign Firm Share of Exports among China's Largest Exporters

Notes: The data reflect the foreign firm export shares among the twenty-five largest exporters in the relevant HS codes (see Table 2). One caveat is that the data are not able to account for “round-trip” FDI in which Chinese domestic firms set up branches or headquarters in a foreign country and then send investment capital back to China disguised as foreign investment. While there are very rough estimates of round-trip FDI in China, this problem affects all research on Chinese FDI. In addition, there has been no research that shows that round-tripping affects some industries more than others, thus its effects may be uniform across these industries.
Figure 2 Export Specialization: Foreign and Domestic Firms (Averages)

Notes: The data indicate the weighted average share of total exports that are within the relevant firms' primary HS code. Because modularity did not produce a clear prediction, only light industry data are displayed.
Figure 3. Industrial Stability: Average Annual Chinese Export Declines

Note: These industry averages are derived from UN Comtrade data and are inflation-adjusted and trade-weighted year-on-year average declines in exports in these sub-sectors from China to its largest export markets: US, Europe, Japan as well as Hong Kong for its entrepot role. China is used as the trade reporter, except for Europe which is used as the reporter for Chinese imports.
Figure 4: Transactional Stability: Coefficient of Variation of Monthly Transactional Value

Notes: These coefficient of variation are the averages of the largest twenty-five firms of the eighteen sub-industries, using the firms’ monthly transactions in the primary HS code from January 2011 to June 2013 (30 months). Higher numbers indicate more volatility; lower numbers indicate greater stability.
Figure 5 Domestic and Foreign Light Industry Firms: Transactional Stability & Export Specialization

Notes: The data are firm-level for all ten light industries (n=249). The percentages in the upper right corner indicate the share of foreign and domestic firms that meet the threshold requirements of less than 0.5 for coefficient of variation (CoV) of monthly transactions (greater transactional stability) in the firm’s primary HS code, and greater than 70% export specialization.