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# GLOBAL VALUE CHAIN ANALYSIS: A PRIMER

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## I. IMPORTANCE OF GLOBAL VALUE CHAINS

The global economy is increasingly structured around global value chains (GVCs) that account for a rising share of international trade, global GDP and employment. The evolution of GVCs in sectors as diverse as commodities, apparel, electronics, tourism and business service outsourcing has significant implications in terms of global trade, production and employment and how developing country firms, producers and workers are integrated in the global economy. GVCs link firms, workers and consumers around the world and often provide a stepping stone for firms and workers in developing countries to integrate into the global economy. For many countries, especially low-income countries, the ability to effectively insert themselves into GVCs is a vital condition for their development. This supposes an ability to access GVCs, to compete successfully and to “capture the gains” in terms of national economic development, capability building and generating more and better jobs to reduce unemployment and poverty. Thus, it is not only a matter of whether to participate in the global economy, but how to do so gainfully.

The GVC framework allows one to understand how global industries are organized by examining the structure and dynamics of different actors involved in a given industry. In today’s globalized economy with very complex industry interactions, the GVC methodology is a useful tool to trace the shifting patterns of global production, link geographically dispersed activities and actors of a single industry, and determine the roles they play in developed and developing countries alike. The GVC framework focuses on the sequences of value added within an industry, from conception to production and end use. It examines the job descriptions, technologies, standards, regulations, products, processes, and markets in specific industries and places, thus providing a holistic view of global industries both from the top down and the bottom up.

The comprehensive nature of the framework allows policy makers to answer questions regarding development issues that have not been addressed by previous paradigms; additionally, it provides

a means to explain the changed global-local dynamics that have emerged within the past 20 years (Gereffi & Korzeniewicz, 1994). As policy makers and researchers alike have come to understand the pros and cons of the spread of globalization, the GVC framework has gained importance in tackling new industry realities such as the role of emerging economies like China and India as new drivers of global value chains, the importance of international product and process certifications as preconditions of competitive success for export-oriented economies, the rise of demand-driven workforce development initiatives as integral to dynamic economic upgrading, and the proliferation of private regulations and standards (Lee, 2010; Mayer & Gereffi, 2010), while also proving useful in the examination of social and environmental development concerns.

This methodology has been adopted by a range of institutions and governments, who have commissioned GVC studies to understand global industries and to guide the formulation of new programs and policies to promote economic development.

## II. WHAT ARE GLOBAL VALUE CHAINS?

The value chain describes the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms (globalvaluechains.org, 2011). In the context of globalization, the activities that constitute a value chain have generally been carried out in inter-firm networks on a global scale. By focusing on the sequences of tangible and intangible value-adding activities, from conception and production to end use, GVC analysis provides a holistic view of global industries – both from the top down (for example, examining how lead firms “govern” their global-scale affiliate and supplier networks) and from the bottom up (for example, asking how these business decisions affect the trajectory of economic and social “upgrading” or “downgrading” in specific countries and regions).

There are four basic dimensions that GVC methodology explores: (1) an input-output structure, which describes the process of transforming raw materials into final products; (2) a geographical consideration; (3) a governance structure, which explains how the value chain is controlled; and (4) an institutional context in which the industry value chain is embedded (Gereffi, 1995). Using these four fundamental dimensions, contributions from Gereffi (1999) and Humphrey & Schmidt (2002) developed an additional element of analysis referred to as *upgrading*, which describes the dynamic movement within the value chain by examining how producers shift between different stages of the chain. Early use of GVC methodology focused principally on economic and competitiveness issues, while recently social and environmental dimensions have been incorporated. GVC research is now exploring new topics such as labor regulation issues, workforce development, the greening of value chains, and gender.

### III. DIMENSIONS OF GVC ANALYSIS

Global value chain analysis is constituted by four dimensions, as discussed below.

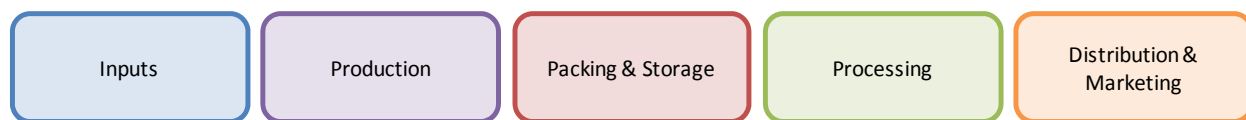
#### 1. Input-Output Structure

##### **a. Identify the main activities/segments in a global value chain.**

A chain represents the entire input-output process that brings a product or service from initial conception to the consumer's hands. The main segments in the chain vary according to the industry, but typically these include: research and design, inputs, production, distribution and marketing, and sales, and in some cases the recycling of products after use. This input-output structure involves both goods and services, as well as a range of supporting industries. The input-output structure is typically represented as a set of value chain boxes connected by arrows that show the flows of tangible and intangible goods and services, which are critical to mapping the value added at different stages in the chain, and to layering in information of particular interest to the researcher (e.g., jobs, wages, gender, and the firms participating at diverse stages of the chain).

In order to understand the entire chain, it is crucial to study the evolution of the industry, the trends that have shaped it, and its organization. Once there is general knowledge about the industry, segments of the chain can be identified and differentiated by the value they add to the product. The researcher develops this chain using secondary data and interviews. The role of the researcher is to link these pieces of information and create a united and self-explanatory chain that includes the principal activities of the industry. The segments of the chain illustrate how different value adding processes contributed to the product or service, and in turn, the differing returns netted for the chain actors behind them.

Diagrams are extremely useful to illustrate the findings. For example, the fruit and vegetables global value chain is comprised of the following segments:

**Figure 1. Fruit and Vegetables Global Value Chain Segments**

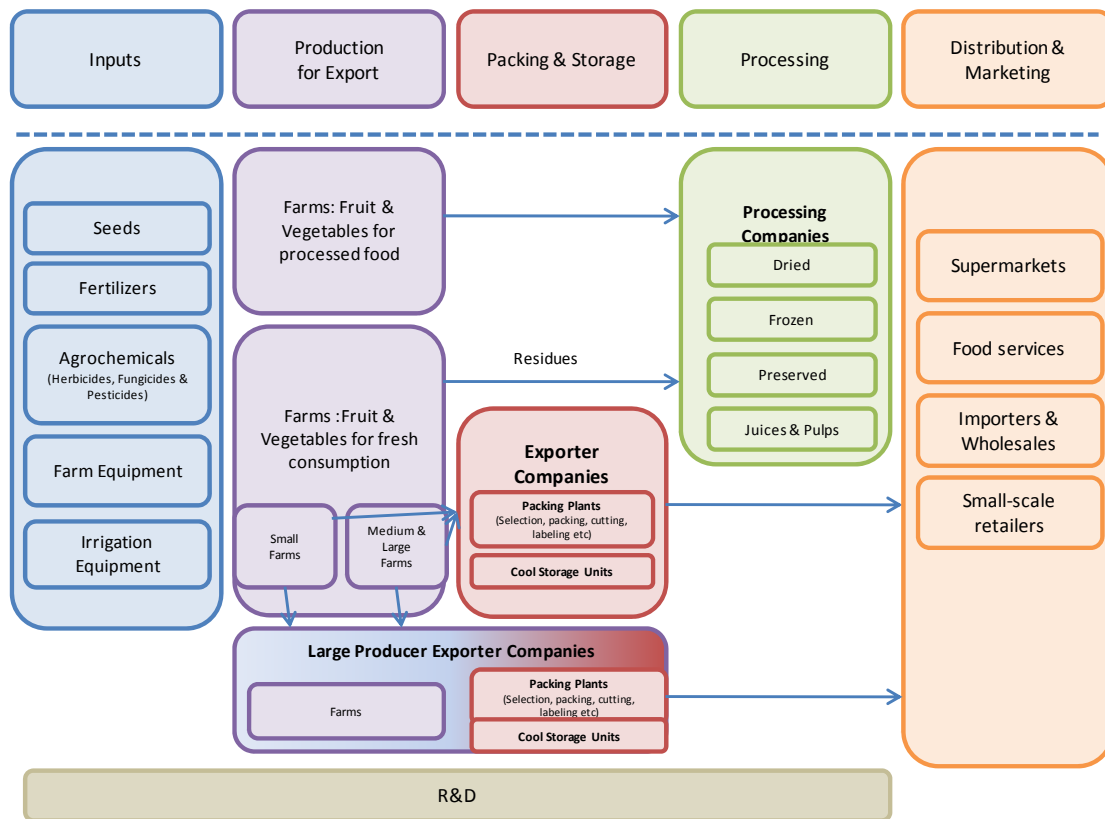
Source: (Fernandez-Stark et al., Forthcoming-c)

**b. Identify the dynamic and structure of companies under each segment of the value chain.**

Each of the segments identified in the previous step have specific characteristics and dynamics, such as particular sourcing practices or preferred suppliers. For example, in the fruits and vegetable value chain, the inputs for the “processing” segment may come from fruits that were intended for export but did not meet the quality controls or it may come from production grown exclusively for processing. It is important to identify the type of companies involved in the industry and their key characteristics: global or domestic; state-owned or private; large, medium, or small; etc. Identifying the firms that participate in the chain will help to understand its governance structure (this dimension will be explained later).

Under the production, distribution and marketing segments, the main producers of fresh produce and the final buyers in the chain are listed in Figure 2.



**Figure 2. Fruit and Vegetables Global Value Chain**

Source: (Fernandez-Stark et al., Forthcoming-c)

## 2. Geographic Scope

The globalization of industries has been facilitated by improvement in transportation and telecommunications infrastructure and driven by demand for the most competitive inputs in each segment of the value chain. Today, supply chains are globally dispersed and different activities are usually carried out in different parts of the world. In the global economy, countries participate in industries by leveraging their competitive advantages in assets. Usually developing countries offer low labor costs and raw materials, while rich nations with highly educated talent are behind research and development and product design. As a result, firms and workers in widely separated locations affect one another more than they have in the past (globalvaluechains.org, 2011).

Geographical analysis is based first on the identification of the lead firms in each segment of the value chain. This information is mainly compiled using secondary sources of firm data, specialized

industry publications, and interviews with industry experts. The presence of a number of these leading firms within particular countries thus informs the country-level positions within the chain. The contributions of different countries within the chain can then be determined by examining country-level data, such as industry exports and the segments in which those exports are concentrated.

One of the main contributions of GVC analysis has been to map the shifts in the geographic scope of global industries. However, GVCs operate at different geographic scales (local, national, regional, and global) and they continue to evolve. New evidence suggests there may be a trend toward a regionalization of GVCs in response to a variety of factors, including the growing importance of large emerging economies and regional trade agreements.

### 3. Governance

Governance analysis allows one to understand how a chain is controlled and coordinated when certain actors in the chain have more power than others. Gereffi (1994, p. 97) defined governance as “authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain.” Initially in the global commodity chains framework, governance was described broadly in terms of “buyer-driven” or “producer-driven” chains (Gereffi, 1994). Analysis of buyer-driven chains highlights the powerful role of large retailers, such as Wal-Mart and Tesco, as well as highly successfully branded merchandisers (e.g., Nike, Reebok), in dictating the way the chains are operated by requiring suppliers to meet certain standards and protocols, despite limited or no production capabilities. In contrast, producer-driven chains are more vertically integrated along all segments of the supply chain and leverage the technological or scale advantages of integrated suppliers. Understanding governance and how a supply chain is controlled facilitates firm entry and development within global industries.

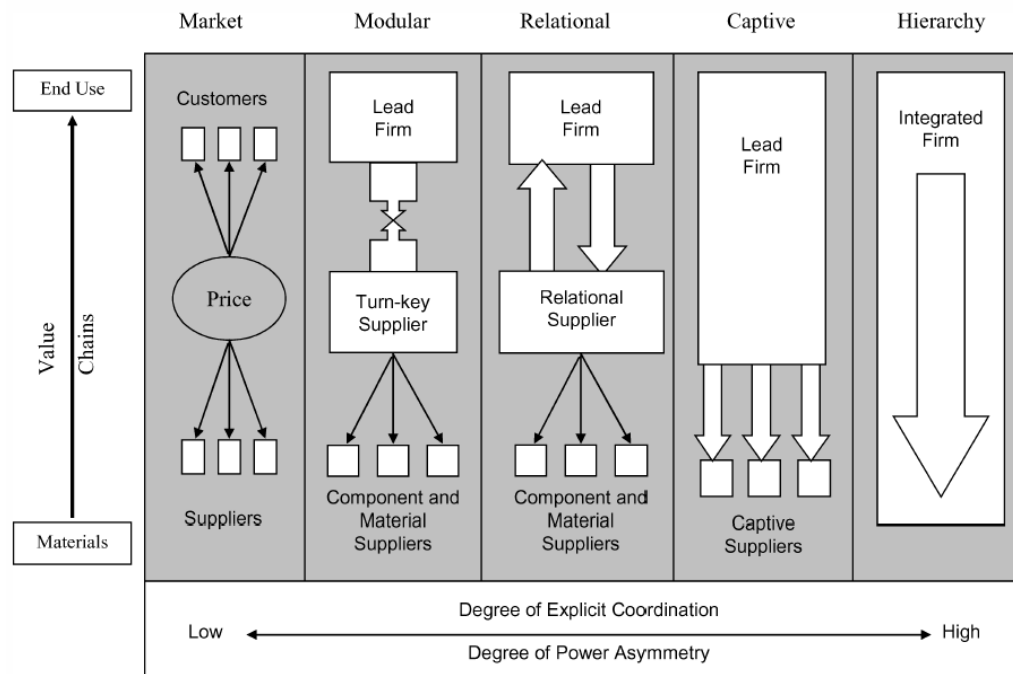
A more elaborate typology of five governance structures has been identified in the GVC literature: markets, modular, relational, captive, and hierarchy (see Figure 3). These structures are measured

and determined by three variables: the complexity of the information between actors in the chain; how the information for production can be codified; and the level of supplier competence (Frederick & Gereffi, 2009; Gereffi et al., 2005).

- **Market:** Market governance involves transactions that are relatively simple. Information on product specifications is easily transmitted, and suppliers can make products with minimal input from buyers. These arms-length exchanges require little or no formal cooperation between actors and the cost of switching to new partners is low for both producers and buyers. The central governance mechanism is price rather than a powerful lead firm.
- **Modular:** Modular governance occurs when complex transactions are relatively easy to codify. Typically, suppliers in modular chains make products to a customer's specifications and take full responsibility for process technology using generic machinery that spreads investments across a wide customer base. This keeps switching costs low and limits transaction-specific investments, even though buyer-supplier interactions can be very complex. Linkages (or relationships) are more substantial than in simple markets because of the high volume of information flowing across the inter-firm link. Information technology and standards for exchanging information are both key to the functioning of modular governance.
- **Relational:** Relational governance occurs when buyers and sellers rely on complex information that is not easily transmitted or learned. This results in frequent interactions and knowledge sharing between parties. Such linkages require trust and generate mutual reliance, which are regulated through reputation, social and spatial proximity, family and ethnic ties, and the like. Despite mutual dependence, lead firms still specify what is needed, and thus have the ability to exert some level of control over suppliers. Producers in relational chains are more likely to supply differentiated products based on quality, geographic origin or other unique characteristics. Relational linkages take time to build, so the costs and difficulties required to switch to a new partner tend to be high.

- **Captive:** In these chains, small suppliers are dependent on one or a few buyers that often wield a great deal of power. Such networks feature a high degree of monitoring and control by the lead firm. The power asymmetry in captive networks forces suppliers to link to their buyer under conditions set by, and often specific to, that particular buyer, leading to thick ties and high switching costs for both parties. Since the core competence of the lead firms tends to be in areas outside of production, helping their suppliers upgrade their production capabilities does not encroach on this core competency, but benefits the lead firm by increasing the efficiency of its supply chain. Ethical leadership is important to ensure suppliers receive fair treatment and an equitable share of the market price.
- **Hierarchy:** Hierarchical governance describes chains characterized by vertical integration and managerial control within lead firms that develop and manufacture products in-house. This usually occurs when product specifications cannot be codified, products are complex, or highly competent suppliers cannot be found. While less common than in the past, this sort of vertical integration is still an important feature of the global economy.

The form of governance can change as an industry evolves and matures, and governance patterns within an industry can vary from one stage or level of the chain to another. In addition, recent research has shown that many GVCs are characterized by multiple and interacting governance structures, and these affect opportunities and challenges for economic and social upgrading (Dolan & Humphrey, 2004; Gereffi, Lee et al., 2009).

**Figure 3. Five Global Value Chain Governance Types**

Source: (Gereffi et al., 2005)

#### 4. Institutional Context

The institutional framework identifies how local, national and international conditions and policies shape the globalization in each stage of the value chain (Gereffi, 1995). GVCs are embedded within local economic, social and institutional dynamics. Insertion in the GVC depends significantly on these local conditions. Economic conditions include the availability of key inputs: labor costs, available infrastructure and access to other resources such as finance; social context governs the availability of labor and its skill level, such as female participation in the labor force and access to education; and finally institutions includes tax and labor regulation, subsidies, and education and innovation policy that can promote or hinder industry growth and development.

Analysis of the local dynamics in which a value chain is embedded requires examination of the stakeholders involved. All the industry actors are mapped in the value chain and their main role in the chain is explained. Because global value chains touch down in many different parts of the

world, the use of this framework allows one to carry out more systematic comparative (cross-national and cross-regional) analysis to identify the impact of different features of the institutional context on relevant economic and social outcomes.

## IV. UPGRADING

The GVC approach analyzes the global economy from two contrasting vantage points: top down and bottom up. The key concept for the top down view is the “governance” of global value chains, which focuses mainly on lead firms and the organization of international industries; and the main concept for the bottom up perspective is “upgrading,” which focuses on the strategies used by countries, regions, and other economic stakeholders to maintain or improve their positions in the global economy. Economic upgrading is defined as firms, countries or regions moving to higher value activities in GVCs in order to increase the benefits (e.g. security, profits, value-added, capabilities) from participating in global production (Gereffi, 2005b, p. 171).

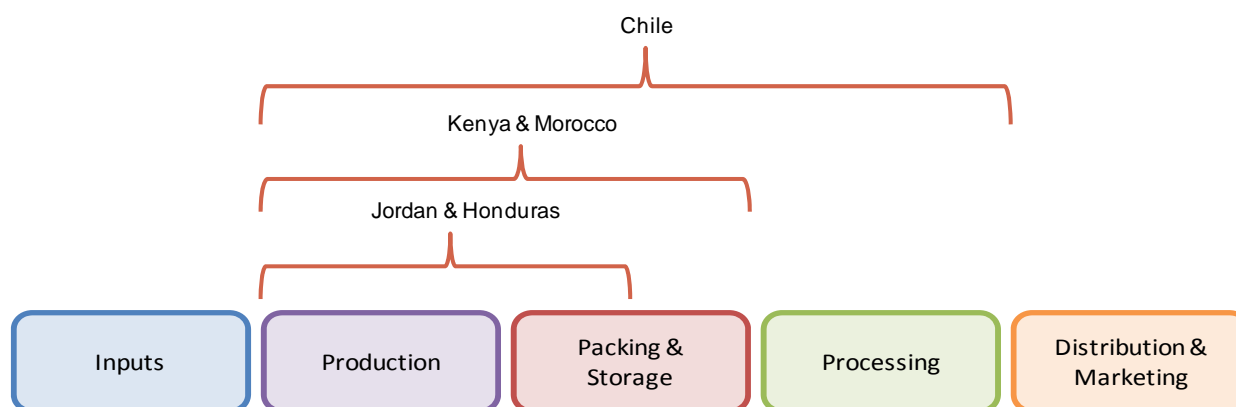
From a dynamic perspective, we can think about upgrading as linked to a series of economic roles and capabilities associated with production and export activities, such as: assembly based on imported inputs (typical of export-processing zones); original equipment manufacturing (OEM), also known as full-package production; original brand name manufacturing (OBM); and original design manufacturing (ODM) (Gereffi, 1999, p. 51). This trajectory (assembly → OEM → OBM → ODM) is neither inevitable nor easy, and GVC studies have analyzed the conditions under which varied patterns of upgrading and downgrading have occurred using these categories.

Diverse mixes of government policies, institutions, corporate strategies, technologies, and worker skills are associated with upgrading success.. Within the GVC framework, four types of upgrading have been identified (Humphrey & Schmitz, 2002):

- *process upgrading*, which transforms inputs into outputs more efficiently by reorganizing the production system or introducing superior technology;
- *product upgrading*, or moving into more sophisticated product lines;
- *functional upgrading*, which entails acquiring new functions (or abandoning existing functions) to increase the overall skill content of the activities; and
- *chain or inter-sectoral upgrading*, where firms move into new but often related industries.

Upgrading patterns differ by both industry and country based on the input-output structure of the value chain and the institutional context of each country. Certain industries require linear upgrading and countries must gain expertise in one segment of the value chain before upgrading into the next segment, as shown below for countries involved in the horticulture value chain (see Figure 4).

**Figure 4. Upgrading Stages of Selected Countries in the Fruit and Vegetables Value Chain**



Source: (Fernandez-Stark et al., Forthcoming-c)

The apparel industry is a classic case that has been used to illustrate different upgrading and downgrading trajectories, since a large number of countries have been significant apparel exporters from the 1970s until the present (Gereffi, 1999; Gereffi & Frederick, 2010). Apparel suppliers in Torreon, Mexico initially entered the **blue jeans industry**<sup>1</sup> in the assembly stage of the

<sup>1</sup> For more details see Bair and Gereffi (2001).

value chain, but they quickly developed expertise in providing trim and labels, and distinct washes and finishes. By 2000, operations based in Torreon had also developed expertise in distribution, shipping their product directly to the point of sale. Figure 5 illustrates the region's upgrading trajectory into new higher value added segments of the apparel value chain between 1993 and 2000.

**Figure 5. U.S.- Torreon Apparel Value Chain: Activities and Location**

1993								
UNITED STATES								
TORREON								
	Textiles	Trims and Labels	Cutting	Assembly	Laundry and Finishing	Distribution	Marketing	Retail
1996								
UNITED STATES								
TORREON								
	Textiles	Trims and Labels	Cutting	Assembly	Laundry and Finishing	Distribution	Marketing	Retail
2000								
UNITED STATES								
TORREON								
	Textiles	Trims and Labels	Cutting	Assembly	Laundry and Finishing	Distribution	Marketing	Retail

Source: (Bair & Gereffi, 2001)

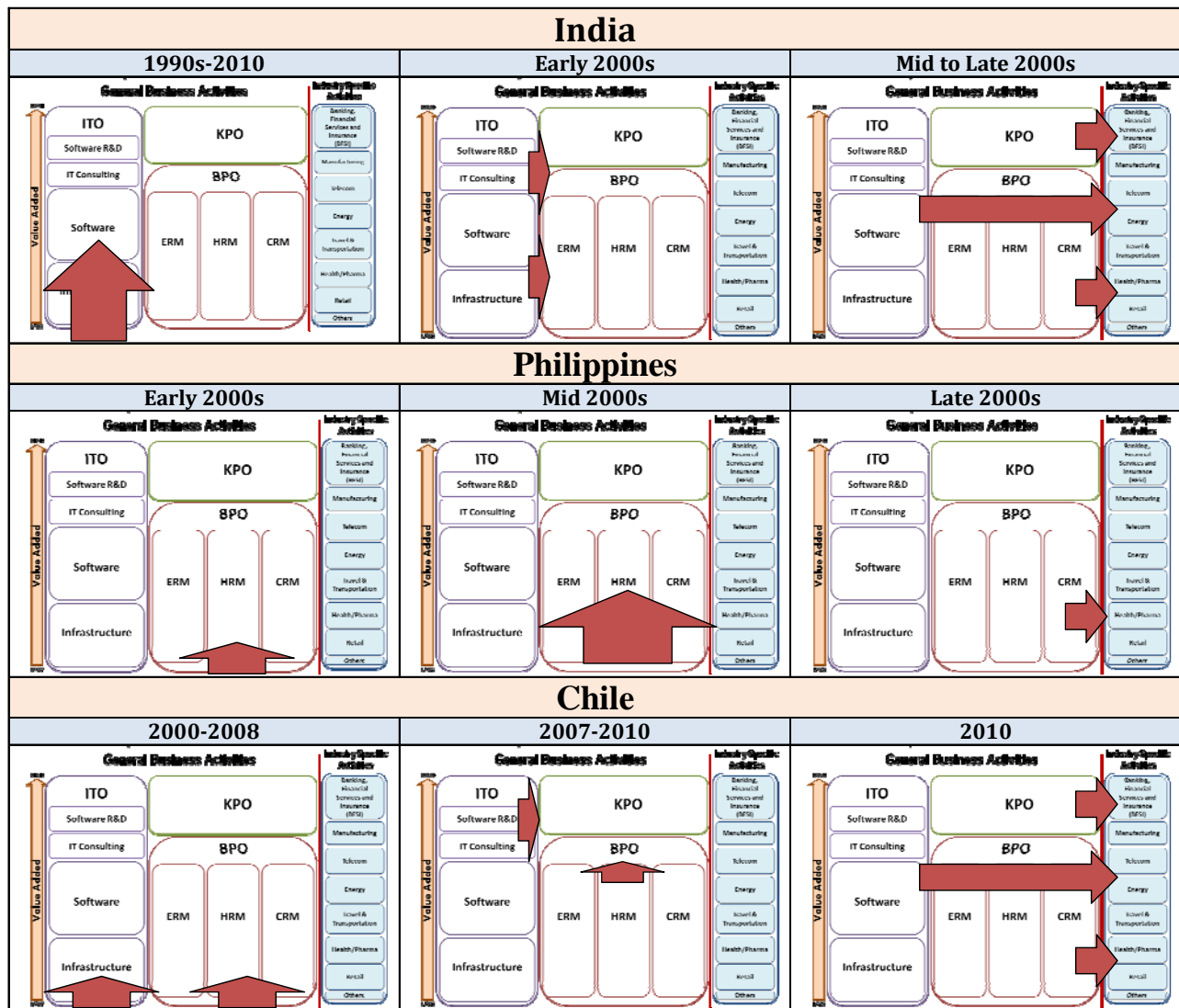
In 1993, only four U.S. manufacturers—Farah, Sun Apparel, Wrangler, and Levi Strauss & Co.—had a significant presence in Torreon. By 2000, the number of export customers grew to more than two dozen. In the early 1990s, the assembly plants on the Mexican side of the border received cut parts from U.S. manufacturers or brokers. These cut parts were sewn into garments and then re-exported to the United States under the “maquila” regime, which allowed tariff-free inputs to be sent from the United States to Mexico as long as they were included in Mexican production for re-export to the United States. Brand marketers and retailers “pulled” Mexican firms to increase their production volumes and the range of activities performed.



Upgrading thus occurred at the firm level in Torreon, in conjunction with the increasing demands of U.S. buyers for full-package production. However, the full-package model did not guarantee long-term success. Blue jean exports from Torreon slumped with the decline in U.S. export demand after 2000, and apparel employment in Torreon, which rose from 12,000 jobs in 1993 to an estimated 75,000 jobs in 2000, declined to 40,000 in 2004. Maintaining a role in the U.S. market in the face of stiff competition from China and other international suppliers required Torreon's blue jeans cluster to continue to upgrade beyond OEM to the OBM and ODM stages of the value chain through the development of local brands, regional marketing directly to U.S. buyers, and the establishment of a local design center in the region (Gereffi, 2005a).

Other industries, such as **offshore services** and tourism, present non-linear upgrading paths; countries can move in different directions and multiple shifts can take place simultaneously. Figure 6 illustrates the complexity of the upgrading trajectories followed by India, the Philippines and Chile in the offshore services value chain, which will be discussed in greater detail in the following section. These cases highlight one of the key findings of GVC studies, which is that access to developed country markets has become increasingly dependent on participating in global value chains led by firms based in developed countries, and in some cases in emerging economies, like India's offshore service providers. Therefore, how value chains function is essential for understanding how firms in developing countries can gain access to global markets, what the benefits from such access might be, and how these benefits might be increased.

Figure 6. Offshore Services Upgrading Trajectories: India, Philippines and Chile



Source: (Fernandez-Stark et al., Forthcoming-b)

## V. RECENT APPLICATIONS OF GLOBAL VALUE CHAIN ANALYSIS

Originally GVC analysis was limited to research on economic development and competitiveness in traditional extractive and manufacturing industries. Nowadays, this analysis has been expanded in several directions to encompass emergent industries such as offshore services and green technologies, the links between social and environment upgrading, and a renewed interest in

workforce development. This section includes several examples of the increasingly diverse application of GVC analysis.<sup>2</sup>

## 1. Globalizing Service Sectors in the World Economy: Offshore Services<sup>3</sup>

Global value chain methodology has proven quite useful in the analysis of services. While the actual sequence of events from production to consumption of a service is short, GVC analysis allows for the incorporation of all of the services supplied within an industry, ranging from very simple tasks to highly sophisticated interactions into one chain. The following example of offshore services illustrates how the GVC framework provides insight into a complex industry and serves as a guide for potential upgrading trajectories.

### **Offshore Services**

Structural changes in the world economy during the past decade have facilitated the global outsourcing of multinational corporations (MNCs), thereby creating the offshore services industry, a new and rapidly growing sector in developing countries (Gereffi & Fernandez-Stark, 2010b, p. 1). Information technology (IT) now allows for quick and easy information transfer. Companies looking to improve their efficiency levels in the global economy, reduce costs and increase flexibility (Lopez et al., 2008) unbundled their corporate functions, such as human resource management, customer support, accounting and finance, and procurement operations, and “offshored” these activities (Gospel & Sako, 2008; Sako, 2006). This reduced the burden of support activities and allowed firms to focus on their core business. The increasing participation of developing countries in this new industry highlights the growing capabilities of the South, not only at the production level but also in creating the knowledge behind the products. The offshore services sector in 2010 accounted for

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<sup>2</sup> For a broader mix of industries, see projects listed on the Duke CGGC website, <http://www.cggc.duke.edu/>

<sup>3</sup> For more information see Fernandez-Stark, Karina, Penny Bamber and Gary Gereffi. (Forthcoming). "The Offshore Services Value Chain: Upgrading Trajectories in Developing Countries." Additional information can be found on the CGGC website: [http://www.cggc.duke.edu/gvc/offshore\\_services\\_industry.php](http://www.cggc.duke.edu/gvc/offshore_services_industry.php)

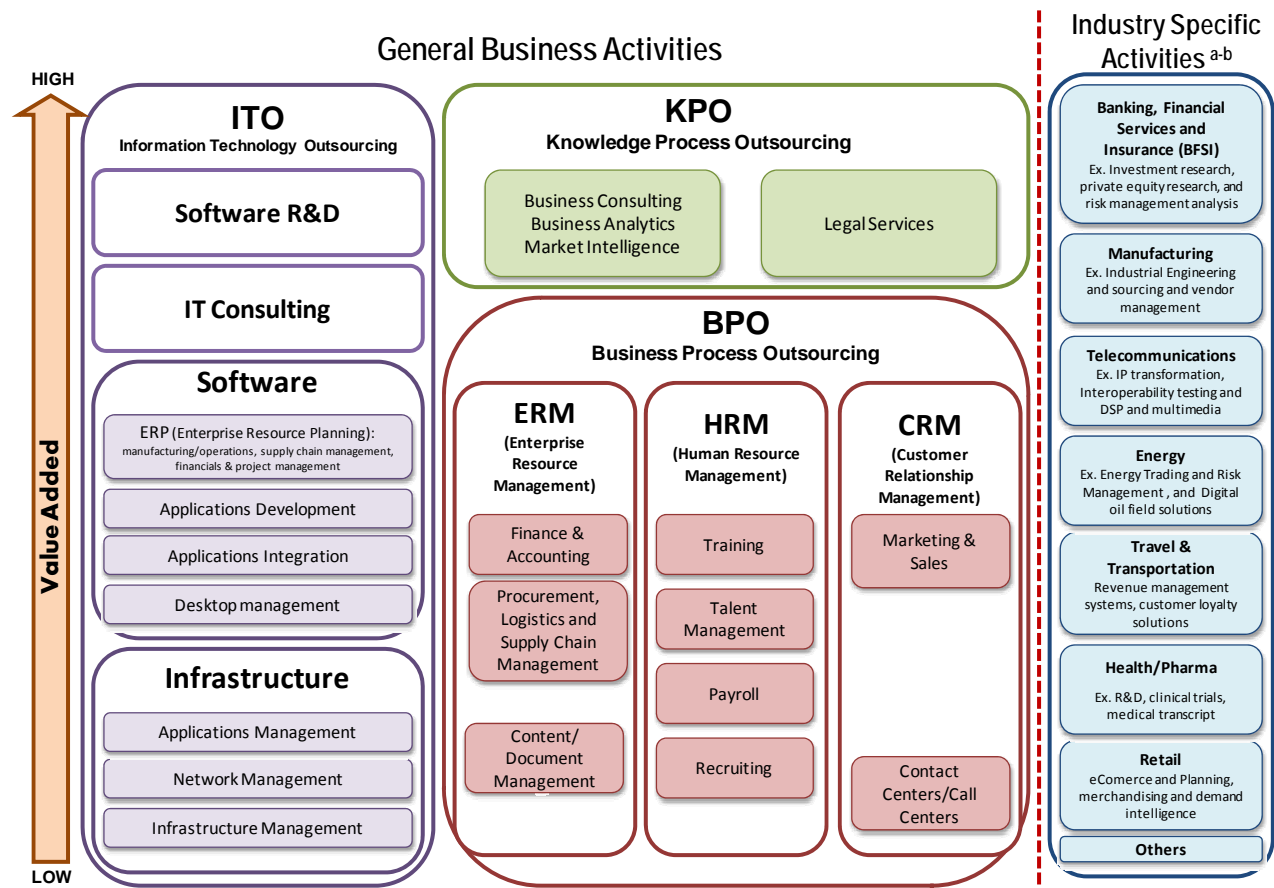
US\$252 billion in revenues and employed over 4 million people globally, most of whom are in developing countries.

The offshore services industry has evolved continuously since its inception, making efforts at categorization challenging. Despite these complexities, a fairly comprehensive, yet flexible, classification of the industry has emerged employing the GVC framework (Gereffi & Fernandez-Stark, 2010a), which uses firm-level analysis to determine the different stages of production of a good or service and the value of each component (Gereffi & Kaplinsky, 2001). For manufacturing and extractive industries based on goods, value-added is determined by the difference between the cost of the inputs and outputs at each stage of the chain. In the case of the offshore services industry, measuring value is complicated by the lack of reliable company-level data and trade statistics for services (Sturgeon & Gereffi, 2009). The rapid evolution of the industry has impeded previous attempts to categorize it, complicating the measurement of the offshore services themselves (ECLAC, 2008, Chapter II; UNCTAD, 2009, Chapter III).

To partially address this problem, the value of different services in the offshore services value chain can be related to skill levels and work experience, that is, the human capital inputs of offshore services. Human capital is a key determinant of value creation and success in service exports from developing countries. Saez & Goswami (2010) find positive and significant correlation between human capital and service exports after controlling for institutional variables and electronic infrastructure. In addition, research by Nyahoho (2010) on the importance of factor intensity as a determinant of trade also shows that human capital is clearly related to exports of information services, while Shingal (2010) finds that human capital is one of three key variables that have the biggest impact on bilateral service trade.

A classification of the offshore services value chain is presented in Figure 7 below. The first categorization refers to three broad types of offshore services that can be provided across all industries (general business services): information technology outsourcing (ITO), business process

outsourcing (BPO), and knowledge process outsourcing (KPO). The second categorization refers to services that are industry specific. Firms providing general business services tend to be process-oriented, while those in the vertical chains must have industry-specific expertise and their services may have limited applicability in other industries. For general business services, all activities are related to supporting generic business functions, such as network management, application integration, payroll, call centers, accounting, and human resources. In addition, they include higher-value services, such as market intelligence, business analytics, and legal services (referred to as KPO in this paper). Within these services, ITO contains a full spectrum of low- middle- and high-value activities of the offshore services chain; BPO activities are in the low and middle segments, while KPO activities are in the highest-value segment of the chain.

**Figure 7. The Offshore Services Global Value Chain**

Notes: <sup>a</sup> Industry specific: Each industry has its own value chain. Within each of these chains, there are associated services that can be offshored. This diagram captures the industries with the highest demand for offshore services.

<sup>b</sup> This graphical depiction of industry specific services does not imply value levels. Each industry may include ITO, BPO and advanced activities.

Source: (Gereffi & Fernandez-Stark, 2010a). See [http://www.cggc.duke.edu/pdfs/CGGC-CORFO The Offshore Services Global Value Chain March 1 2010.pdf](http://www.cggc.duke.edu/pdfs/CGGC-CORFO%20The%20Offshore%20Services%20Global%20Value%20Chain%20March%201%202010.pdf).

Within the GVC framework, upgrading can be classified in four different ways: process upgrading, product upgrading, functional upgrading and chain or inter-sectoral upgrading (Humphrey & Schmitz, 2002). Adapting this scheme to our case evidence, five principal upgrading trajectories can be identified from the 10 country case studies we are examining: Entry into the value chain; upgrading within the BPO segment; offering full package services; the expansion of IT firms into KPO services; and the specialization of firms in vertical industries. These five upgrading trajectories are presented in Figure 8.

Figure 8. Examples of Upgrading Trajectories in the Offshore Services Value Chain

Type	Diagram*	Description
Entry into the Value Chain		<ul style="list-style-type: none"> <li>Common way to enter the offshore services value chain is through the establishment of call center operations.</li> <li>Opportunity for low-income countries to enter into the knowledge economy.</li> </ul> <p>Recent examples of countries entering the value chain through call centers include El Salvador (Dell, Sykes and Teleperformance), Nicaragua (Sitel), Panama (HP and Caterpillar) and Guatemala (Exxon Mobil, ACS and 24/7 Customer) (Gereffi, Castillo et al., 2009).</p>
Upgrading within the BPO Segment		<ul style="list-style-type: none"> <li>Companies expand their BPO services within the segment.</li> <li>Improving and expanding call centers operations or specialization in certain areas.</li> </ul> <p>South Africa has been an important destination for BPO services currently employing around 87,000 people and growing at 33% per year. South Africa is actively working in expanding their BPO activities (Everest Group and Letsema Consulting, 2008; Sykes, 2010).</p>
Broad Spectrum Services (Functional)		<ul style="list-style-type: none"> <li>Companies positioned in the ITO and KPO segments may opt to provide a more comprehensive range of activities and include BPO services.</li> <li>Acquisitions of smaller BPO firms and/or creating a new business unit within the company.</li> </ul> <p>India has seen a number of firms in the IT and consulting (KPO) segment expand to the BPO sector. This is true for both big domestic firms like Infosys, Wipro and also foreign firms located in India like IBM and Accenture among others.</p>
Upgrading from ITO to KPO functions (Functional Upgrading)		<ul style="list-style-type: none"> <li>IT service firms include KPO activities in their portfolio.</li> <li>IT companies engage customers to find solutions for unsolved business problems.</li> </ul> <p>For example, between 2002 and 2005, Indian firms Infosys, Wipro, TCS and WNS amongst others developed and launched business consulting services practices.</p>
Industry Specialization (Intersectoral)		<ul style="list-style-type: none"> <li>Companies offering some ITO, BPO and KPO services for a wide range of industries start specializing and focus on key industries to develop expertise.</li> </ul> <p>The Czech Republic, which entered into the offshore services industry through the establishment of BPO shared services activities, has quickly upgraded into R&amp;D segments of vertical industries, particularly in the automotive, aerospace and IT areas (Business and Innovation Center- Brno, 2009).</p>

Source: (Fernandez-Stark et al., Forthcoming-b)

## 2. Emerging Industries: Clean Technologies (Low-Carbon and Renewables)

Global value chain analysis has been helpful in mapping out the value chain of emerging industries based on key new technologies to gauge the possibilities for job creation in a “green” economy and to analyze energy efficiency best practices for industry. Two cases are included below to illustrate how GVC methodology is applied to clean technologies: the U.S. value chain for manufacturing railcars and the U.S. smart grid.

### a. U.S. Manufacture of Rail Vehicles<sup>4</sup>

Clean energy transportation has become a priority in the United States in order to promote clean technology and U.S. jobs. Transportation accounts for 30% of U.S. greenhouse gas emissions and 70% of the nation's oil use. Duke CGGC reports on clean energy transportation (e.g., public transit buses, rail vehicles, and lithium-ion batteries for electric cars) highlight technologies that can reduce carbon emissions and oil dependence, while creating U.S. manufacturing jobs. The value chain approach is well suited to this task because its input-output analysis allows us to identify the major manufacturing activities in each stage of the value chain, and then we can identify the companies that participate in these chains and the geographic locations where jobs within the value chain are located. The U.S. manufacture of rail vehicles is of particular relevance to job creation because it also involves the maintenance and upgrading of the extensive infrastructure needed for passenger and freight railcars.

Since the 1950s, the United States has invested far more heavily in highways and air transport than in rail transportation. There are signs, however, that the nation is beginning to step up its commitment to rail by increasing funds for intercity passenger rail (Amtrak) and urban transit rail (metros, light rail and streetcars). The 2009 American Recovery and Reinvestment Act (ARRA) provided a total of

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<sup>4</sup> For more details see: Lowe, Marcy, Saori Tokuoka, Kristen Dubay, and Gary Gereffi. (2010). “U.S. Manufacture of Rail Vehicles for Intercity Passenger Rail and Urban Transit: A Value Chain Analysis.”



\$17.7 billion for transit (including bus transit) and intercity rail programs combined,<sup>5</sup> including \$1.3 billion for Amtrak and \$8 billion for new high-speed rail corridors and intercity passenger rail. These are small investments compared to those in other countries with well-developed rail systems, but they constitute a watershed in the nation's commitment to passenger rail, and they have been presented as a "down payment" on future investments (White House, 2010). Similarly, current proposals for the much-anticipated renewal of the nation's six-year surface transportation bill call for significantly greater commitments to public transit, including rail.

*Key findings:*

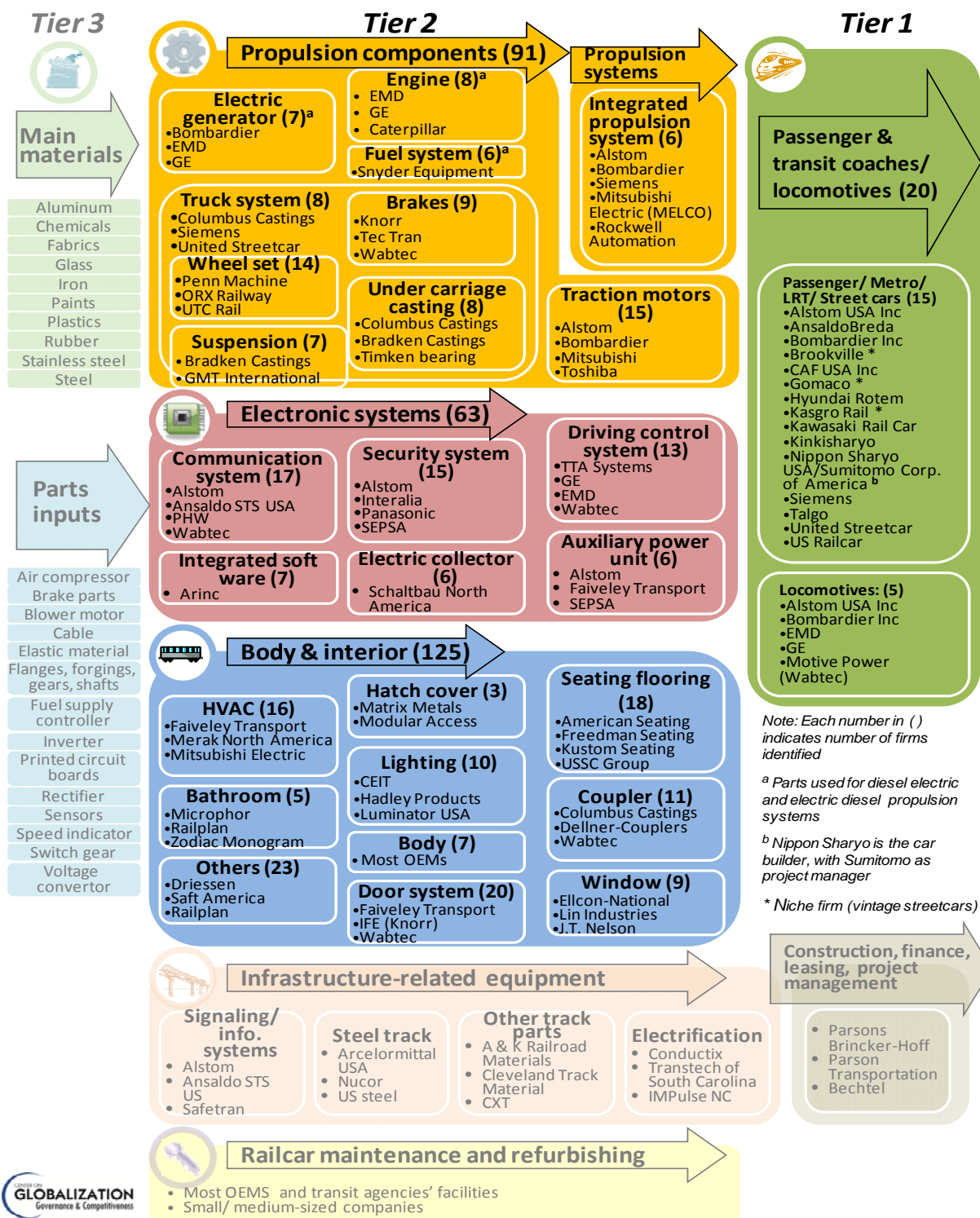
- The supply chain includes at least 249 U.S. manufacturing locations in 35 states.
- While U.S. domestic content rules have ensured that 60% of content is U.S.-made, higher-value activities are still mostly performed abroad
- The U.S. value chain includes several gaps—specific manufacturing activities that are not typically performed in the United States
- Manufacture and assembly of passenger and transit railcars and locomotives comprise an estimated 10,000 to 14,000 U.S. jobs
- These jobs may have a more positive impact than their numbers suggest.
- Growing the U.S. industry will require committing much larger and more consistent U.S. investments to intercity passenger and urban transit rail
- Several additional measures can help develop the U.S. industry and capture higher value activities in the supply chain.

To determine the extent of U.S. manufacturing potential and show where it lies, the report mapped out the U.S. supply chain for six railcar types: intercity passenger, high speed, regional, metro, light rail, and streetcars (see Figure 9 below). Key features of the value chain approach that can be seen in Figure 9 include: the mapping of economic activities in terms of tiered suppliers; the identification of discrete subassemblies within each tier; and the overlay of main companies onto the value chain.

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<sup>5</sup> Calculation by Michael Renner, Senior Researcher at Worldwatch Institute, based on data from the GovernmentAccountability Office, Federal Transit Administration, and Federal Railroad Administration.

Figure 9. U.S. Value Chain for Passenger and Transit Rail Vehicles



Source: (Lowe et al., 2010),

<http://www.cggc.duke.edu/pdfs/U.S. Manufacture of Rail Vehicles for Intercity Passenger Rail and Urban Transit.pdf>

## **b. U.S. Smart Grid<sup>6</sup>**

The smart grid is often referred to as an “energy internet”—a decentralized system that turns the electric power infrastructure into a two-way network. This smart system allows utilities and customers to share information in real time so they can more effectively manage electricity use. The Pacific Northwest National Laboratory (PNNL) estimates that a fully deployed smart grid could reduce the U.S. electricity sector’s energy and emissions by 12% in 2030.<sup>7</sup> Even greater savings would accrue from tapping the smart grid as an enabler of clean energy sources. If accompanied by substantial support for decentralized power, renewable power, and electric vehicles, smart grid could reduce energy and emissions by an estimated 525 million metric tons, or 18% of the total from the electric sector (PNNL, 2010).

The United States is among the global leaders in smart grid development, which is expected to create tens of thousands of jobs annually in coming years. Previous research suggests that for each \$1 million in investment, a range of 4.3 to 8.9 direct and indirect jobs will be created.<sup>8</sup> For example, global energy consulting firm KEMA, using the low end of this range, estimated that 278,600 U.S. smart grid jobs will be created by 2012, including jobs with utilities, contractors, and suppliers (KEMA, 2009).

The report on U.S. Smart Grid prepared by Duke CGGC focuses on the subset of these jobs represented by the broad array of supplier firms involved, including those that have traditionally provided electric equipment and those that provide information technology (IT), core communications, smart hardware, energy services, energy management, telecom service, and system integration. The report examines 125 leading smart grid firms in order to help assess their potential role in creating jobs. These lead firms provide hardware, software and services, which are divided

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<sup>6</sup> For more details, see the report: Lowe, Marcy, Hua Fan and Gary Gereffi. (2011). “U.S. Smart Grid: Finding New Ways to Cut Carbon and Create Jobs.”

<sup>7</sup> Baseline 2030 emissions as forecast by the U.S. Energy Information Agency (EIA).

<sup>8</sup> 4.3 multiplier is calculated from (KEMA, 2009); 8.9 multiplier is from (Robert Pollin, 2009).

into nine broad categories of smart grid technologies. Where possible, the report identifies what hardware, software and services each firm provides, and in which U.S. locations the relevant manufacturing and product development occurs.

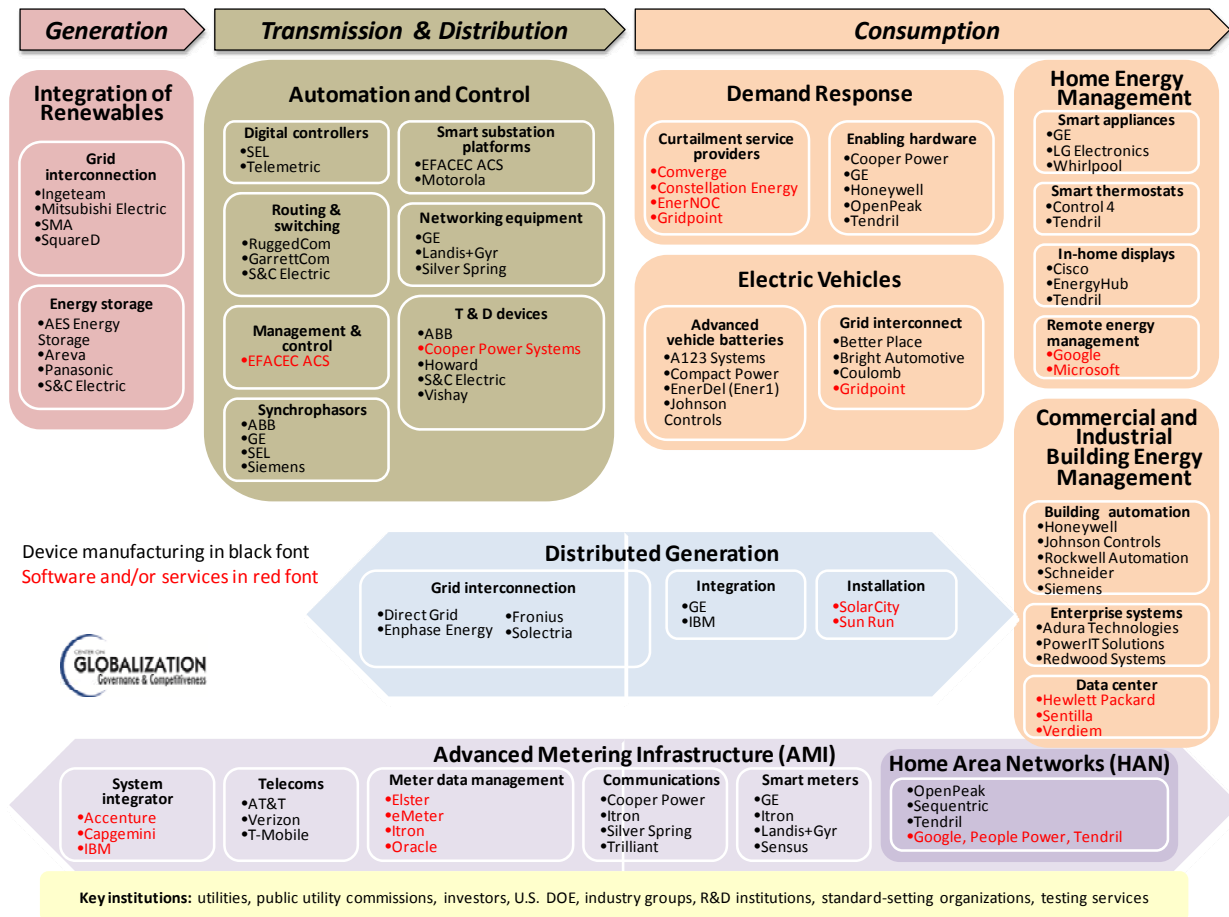
The U.S. value chain for smart grid vendors is found in Figure 10. The left-to-right structure begins with power generation, moves through transmission and distribution, and ends with consumption. This roughly parallels the process in which electric power is delivered to the customer: first electricity is generated, then it is stepped up by transformers to a high voltage so it can be transmitted over long distances (similar to the way high water pressure is needed to transport water), then it arrives at a substation, where it is stepped back down to a lower voltage that is safer for local distribution. Most smart grid activity is focused not on transmission but on the distribution side of the chain—the part that stretches from the substation to the customer.<sup>9</sup> As for the hardware, software and services that make up the smart grid market, they can be thought of as two market segments. In the first market (utility side), products for generation, transmission and distribution are largely sold by vendors to utilities. In the second market (consumer side), products tend to be sold directly to consumers, often with utilities' close cooperation (Kanellos, 2010).

In the value chain the main functional categories (eight colored boxes with headings in bold) are divided into major product types (white boxes). Selected leading U.S. vendors are listed for each product (hardware in black font, software and/or services in red).

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<sup>9</sup> GTM Research analyst David Leeds writes, “The challenges at the transmission level are less about adding intelligence, and more about ensuring that there are adequate amounts of transmission to move bulk power to where it is most needed” (Leeds, 2009a).

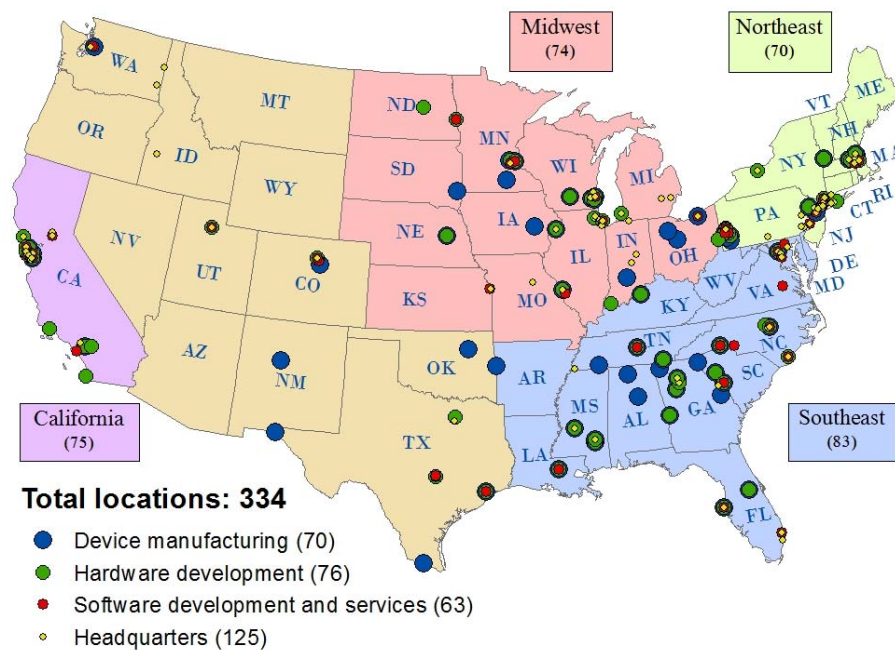
Figure 10. U.S. Smart Grid Vendor Value Chain



Source: (Lowe et al., 2011). See [http://www.cggc.duke.edu/pdfs/Lowe\\_US\\_Smart\\_Grid\\_CGGC\\_04-19-2011.pdf](http://www.cggc.duke.edu/pdfs/Lowe_US_Smart_Grid_CGGC_04-19-2011.pdf)

### Key findings:

- 334 U.S. relevant employee locations in 39 states. See the map below (Figure 11).
- Smart grid provides a way for well-established firms to transition from traditional products into new areas, including new manufacturing opportunities.
- The fast-growing global market for smart grid technologies presents valuable export opportunities to be tapped by U.S. firms, large and small.
- Future U.S. job creation by product vendors will likely concentrate in high-value IT innovations, product development, and systems design and engineering
- Regardless of where smart grid products are made, many additional U.S. smart grid jobs will be located in the service territories of participating utilities, which means they cannot be off-shored.

**Figure 11. Relevant Employee Locations of Leading U.S. Smart Grid Vendors**

Note: Software development and services (63 sites) is an undercount, since these activities often are also performed at company headquarter sites.

Source: (Lowe et al., 2011).

As with the U.S. railcar study, a value chain approach to the U.S. smart grid illustrates all four dimensions of GVC analysis: (1) it highlights the complex input-output structure of the industry with an emphasis on core technologies and key subassemblies; (2) it maps the relevant geography of the industry, in this case in terms of a national frame of reference; (3) it indicates the major companies that are involved in different stages of the value chain, and those companies that occupy high-technology and other strategic nodes of the chain are identified and discussed in the report; and (4) the institutional context of the industry is analyzed in terms of the opportunities for policy interventions that would improve upgrading outcomes and the trade-offs that expansion of this sector would entail for economic and social actors.

### 3. Linking Social and Economic Upgrading<sup>10</sup>

The concepts of social and economic upgrading are important factors within global value chains. They contribute to more sustainable growth and development. Economic upgrading stimulates innovation and competitiveness among firms. Social upgrading promotes employment based on decent work and respect for labor standards. However, how the two relate, and what strategies can help to combine them, require further analysis. The limited research available confirms that economic upgrading can result in social upgrading, but this does not happen automatically. Thus, economic upgrading can be related to declines in employment and to deteriorating working conditions. However, it is not clear how economic and social upgrading affect different groups of firms and producers defined according to size, position in the value chain, or formality, as well as different groups of workers defined according to income, skills, formality, or gender. These are topics that ongoing research is addressing.

In 2009 a group of GVC academics launched the program, “Capturing the Gains: Economic and Social Upgrading in Global Production and Trade” supported by the UK Department for International Development (DFID) and the Swiss Agency for Development and Cooperation.<sup>11</sup> The program provides a new approach to understanding economic development, and offers a fresh perspective on development policy in a global economy. This research aims to ensure that participation in a global economy translates into better jobs for workers in developing countries, promoting the concept of decent work and respect for labor standards. Cross-country sector studies explore the national, regional and global dynamics between lead firms in the North and emerging lead firms in the South. The “Capturing the Gains” research program explores the role of private sector, civil society, national governments and international organizations in securing real gains for poorer workers and producers in the South, including the four emerging economies of India, China,

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<sup>10</sup> For more information see Barrientos, Stephanie, Gary Gereffi and Arianna Rossi. (2010). “Economic and Social Upgrading in Global Production Networks: Developing a Framework for Analysis.”

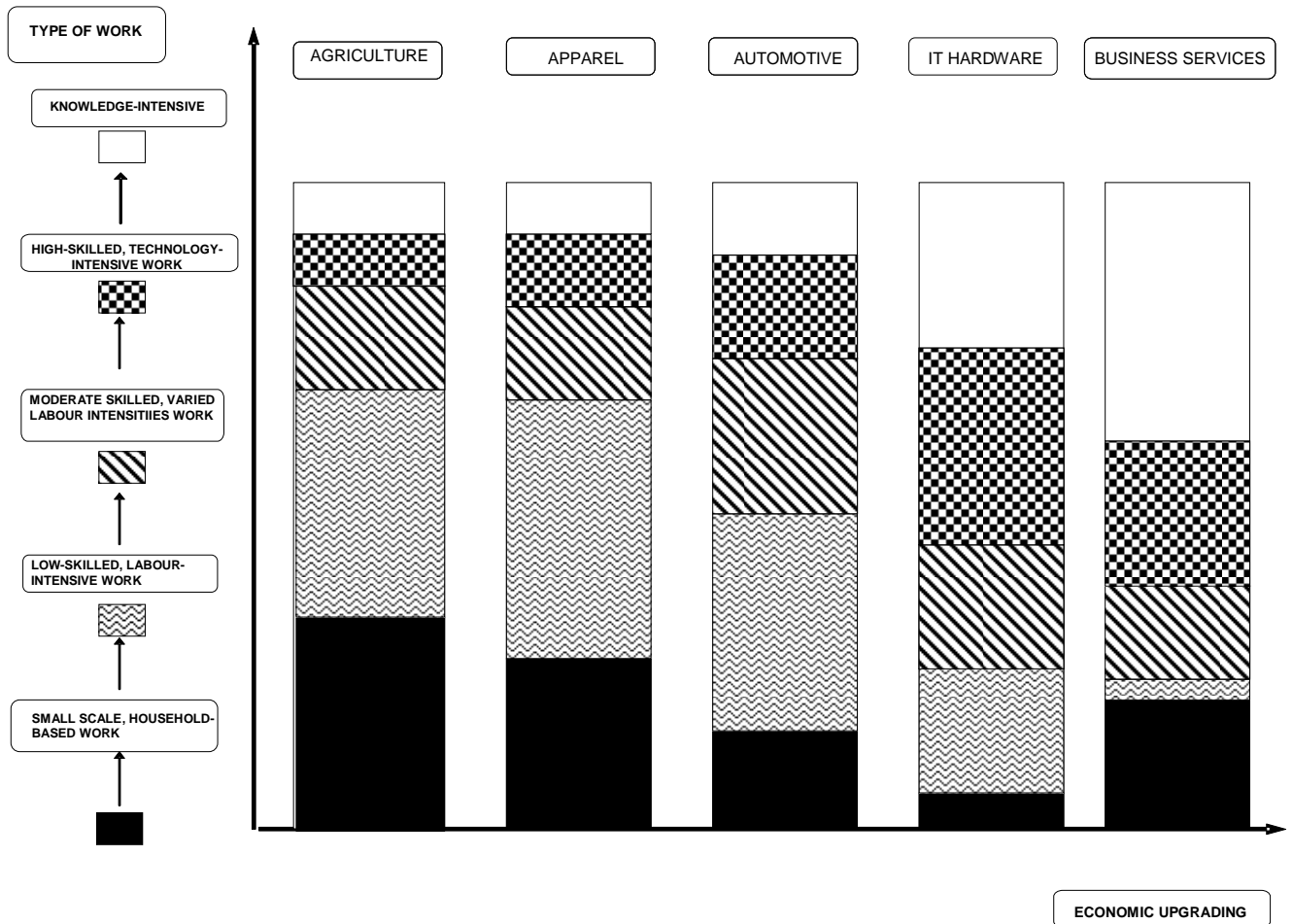
<sup>11</sup> See <http://www.capturingthegains.org/>.

Brazil, and South Africa, and a number of less-developed countries in four sectors (horticulture, apparel, mobile telecommunication devices and tourism)..

Recently, Barrientos et al. (2010) have developed a framework for examining the linkages between the economic upgrading of firms and the social upgrading of workers. The study explores different trajectories and scenarios in order to consider under what circumstances both firms and workers can gain from a process of upgrading. A simplified typology is used to identify five types of GVCs that combine different categories of work (varying the skill levels) with different types of industries (that vary in their labor-, capital- and technological intensity). Figure 12 shows graphically how different GVCs can involve different combinations of low-skill, labor-intensive and higher-skill, technology-intensive work.

If we compare agriculture, manufacturing, and services, all five types of work are present in each sector. However, there are significant differences in the proportions of each type of work across various industries within these sectors. Agro-food involves a relatively large proportion of small scale and low-skill labour-intensive production, particularly at the farm level. Within manufacturing, if we compare industries that can be classified as relatively low-tech (apparel), medium-tech (automotive), and high-tech (electronics), the low-skilled and household-based types of work decrease, and the relative importance of knowledge-intensive and highly-skilled work increases. This progression at the work level is associated with economic upgrading. As we move to more technology- and knowledge-intensive GPNs, such as IT, we find that labour-intensive production does not disappear but is relatively lower.



**Figure 12. Typology of Workforce Composition across Different Industries**

Source: (Barrientos et al., 2010)

A key task for GVC analysis is to explain the conditions under which the economic upgrading of firms and the social upgrading of workers can be mutually reinforcing. Figure 13 below provides one step in that direction by identifying the main commercial and social drivers of economic and social upgrading that are likely to operate in the industries that one might wish to study.

**Figure 13. Commercial and Social Drivers for Up/Downgrading**

	Economic Up/Down-grading	Social Up/Down-grading
<b>Commercial Drivers</b>	<ul style="list-style-type: none"> <li>• Cost (wages, transportation, inputs)</li> <li>• Time to market</li> <li>• Volume &amp; quality</li> <li>• End-market demand/preference</li> <li>• Technology and skills</li> <li>• The nature and location of GVC lead firms</li> <li>• Safety/quality standards &amp; certifications</li> </ul>	<ul style="list-style-type: none"> <li>• Cost (wages, transportation, inputs)</li> <li>• Time to market</li> <li>• Volume &amp; quality</li> <li>• End-market demand/preference</li> <li>• Technology and skills</li> <li>• The nature and location of GVC lead firms</li> <li>• Social (ethical) standards &amp; certifications</li> <li>• Corporate social responsibility</li> </ul>
<b>Social Drivers</b>	<ul style="list-style-type: none"> <li>• Policies and regulations: trade/competition; labor/workforce development; technology/innovation</li> <li>• National and regional industrial policy (incl. SEZs, industrial clusters)</li> <li>• Demand for more jobs and higher standard of living</li> <li>• Entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>• Effectiveness of labor law</li> <li>• Policies and regulations: education/skills; health/safety; gender; environment</li> <li>• Degree of activation of NGOs</li> <li>• Existence and power of trade unions</li> <li>• Nature of industrial relations (e.g., tripartite cooperation)</li> </ul>




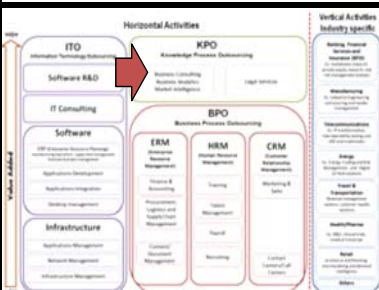
Source: Gary Gereffi and Joonkoo Lee.

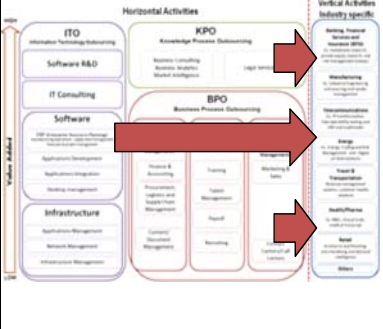
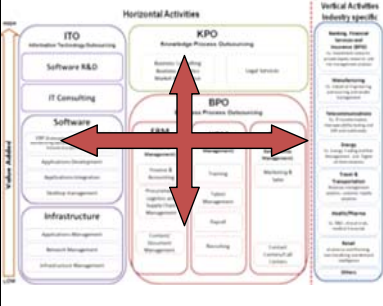
## 4. Workforce Development

A final illustration of new applications of GVC analysis is the topic of workforce development. Duke CGGC together with RTI International has been working to understand workforce development issues using the GVC methodology. This undertaking incorporated a multi-industry and multi-country analysis of upgrading trajectories and workforce initiatives that helped to drive these shifts. The industry and country cases selected are: (1) fruit and vegetables (Chile, Kenya, Morocco, Jordan and Honduras); (2) apparel (Turkey, Sri Lanka, Bangladesh, Nicaragua and Lesotho); (3) offshore services (India, The Philippines, Chile and Central American Countries); and (4) tourism (Costa Rica, Vietnam and Jordan).

In each segment of these value chains, Duke CGGC found that workers required specific skills that frequently are regulated by global rather than local actors. Figure 14 below provides a summary of workforce development implications in the offshore services value chain. It was found that developing countries in offshore services are engaging in market-driven development—acquiring capabilities to upgrade services (providing better services, expanding the number of services or/and offering higher value added services)—through significant investments in workforce training and managerial capabilities, provided initially by private offshore service providers but now increasingly supported by an expanded range of public, private, and multi-sector initiatives. Far from a race to the bottom, involvement in the offshore services industry has provided developing country workers, firms, and governments with an attractive opportunity to build the skill-based competencies required to meet the demands of global service markets.

**Figure 14 Examples of Upgrading Trajectories in the Offshore Services Value Chain and Workforce Development Initiatives**

Type	Diagram	Workforce Development Initiatives	
Entry into the Value Chain		<ul style="list-style-type: none"> <li>Call centers hire people with high school diplomas or bachelor's degrees.</li> <li>Further skills training is provided by the company.</li> </ul> <p>In <b>Guatemala</b>, inter-institutional alliances were created to promote call center and BPO skills training. Intecap, a technical training institution funded through a 1% levy on salaries has been central to these initiatives (ECLAC, 2009).</p>	
Upgrading within the BPO Segment (Functional Upgrading)		<ul style="list-style-type: none"> <li>Skills development is carried out by the private sector, either through in-house or contracted training programs.</li> <li>Educational institutions and governments help to develop course content and provide scholarships.</li> </ul> <p>In <b>South Africa</b>, the government created the BPO Support Programme to generate more jobs. The program includes training for 35,000 direct jobs and 4,000 in middle management. (Business Trust- South Africa, 2010).</p>	
		<b>Type of skills preparation</b> <ul style="list-style-type: none"> <li>Short Training</li> <li>Formal education (degree required)</li> </ul>	<b>Institutions involved</b> <ul style="list-style-type: none"> <li>Private sector</li> <li>Government</li> <li>Tertiary educational institutions</li> </ul>
Full Package Services (Functional Expansion)		<ul style="list-style-type: none"> <li>Expansive hiring process targets candidates with high school diploma and/or colleges graduates to work in this industry.</li> <li>New hires must first complete BPO training programs to guarantee quality services. This refers to the same training offered in the "Upgrading within the BPO segment"</li> </ul> <p>In the early 2000s in <b>India</b>, there was a significant push into the BPO segment by ITO and KPO firms. Recruiting was the central aspect to this expansion, and firms focused particularly on hiring women from middle class background.</p>	
Upgrading from ITO to KPO functions (Chain Upgrading)		<ul style="list-style-type: none"> <li>Personnel with higher education qualifications recruited. Typically MBA graduates and workers with business experience. These workers must have sharp analytical skills.</li> </ul> <p>Legal Process Outsourcing requires qualified lawyers. By 2015, LPO will employ 17,000 professionals (Evalueserve, 2010). These lawyers undergo similar training as in the US.</p>	
		<b>Type of skills preparation</b> <ul style="list-style-type: none"> <li>Formal education (degree required)</li> </ul>	<b>Institutions involved</b> <ul style="list-style-type: none"> <li>Tertiary educational institutions</li> </ul>

<b>Vertical Specialization (Chain Upgrading)</b>		<ul style="list-style-type: none"><li>• Companies hire area experts to sustain their competitive advantage in specific areas.</li><li>• For example, a BPO company providing medical transcription services must hire nurses and doctors to ensure accurate service provision.</li></ul> <p>In the <b>Czech Republic</b>, the government has been incentivizing advanced degrees such as Masters and PhD degrees. Masters students accounted for 40% of the university student population (Goglio, 2006). Today there are more than 73,000 technical university students engaged in R&amp;D in different areas.</p> <table><tr><td><b>Type of skills preparation</b><ul style="list-style-type: none"><li>• Formal education (degree required)</li><li>• Usually MA and PhD degrees</li></ul></td><td><b>Institutions involved</b><ul style="list-style-type: none"><li>• Tertiary educational institutions</li></ul></td></tr></table>	<b>Type of skills preparation</b> <ul style="list-style-type: none"><li>• Formal education (degree required)</li><li>• Usually MA and PhD degrees</li></ul>	<b>Institutions involved</b> <ul style="list-style-type: none"><li>• Tertiary educational institutions</li></ul>
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<b>Process Upgrading</b>		<ul style="list-style-type: none"><li>• Companies undertake process improvements to upgrade their global capabilities.</li></ul> <p>For example, Siemens has specific strategies for organizational training on CMMI (one of the most popular process improvement certification in this industry). The strategy consist on defining the jobs skills necessities, assess who need the training, train workers with skill gaps, record progress and monitor new skills gaps (Hefner &amp; Yellayi, 2005).</p> <table><tr><td><b>Type of skills preparation</b><ul style="list-style-type: none"><li>• Internal training</li></ul></td><td><b>Institutions involved</b><ul style="list-style-type: none"><li>• Private sector</li><li>• Certification Institutes (on-site or online)</li></ul></td></tr></table>	<b>Type of skills preparation</b> <ul style="list-style-type: none"><li>• Internal training</li></ul>	<b>Institutions involved</b> <ul style="list-style-type: none"><li>• Private sector</li><li>• Certification Institutes (on-site or online)</li></ul>
<b>Type of skills preparation</b> <ul style="list-style-type: none"><li>• Internal training</li></ul>	<b>Institutions involved</b> <ul style="list-style-type: none"><li>• Private sector</li><li>• Certification Institutes (on-site or online)</li></ul>			

Source: (Fernandez-Stark et al., Forthcoming-a).

## VI. CONCLUSIONS

Globalization has given rise to a new era of international competition that is best understood by looking at the global organization of industries and how countries rise and fall within these industries. The global value chains framework has evolved from its academic origins to become a major paradigm used by a wide range of international organizations, like the World Bank, the International Labor Organization, the U.K. Department for International Development, and the U.S. Agency for International Development. Global value chains highlight how new patterns of international trade, production, and employment shape the prospects for development and competitiveness, using core concepts like “governance” and “upgrading.”

On the governance side, global value chains are becoming more consolidated (Cattaneo et al., 2010). Large multinational manufacturers, retailers, and marketers who manage global sourcing networks are proclaiming that they want fewer, larger and more capable suppliers, and they will operate in a reduced number of strategic locations around the world. This is likely to promote a

higher degree of regional sourcing, with suppliers located close to the major consumer markets in North America, Western Europe, and East Asia. In terms of upgrading, this offers some hope for small regional suppliers, but organizing efficient and sustainable value chains at the regional level remains challenging.

Today we are at a historic juncture. Decision-makers concerned with the role that GVCs may play in promoting development face difficulties in adjusting to a world in which the primary drivers in global production and trade are emerging economies. Until recently, trade integration and growth in many developing countries were fuelled by the insertion of local producers in GVCs feeding into high-income markets, in particular North America, Europe and Japan, and in chains led by firms from high-income economies. Recently, however, low growth or stagnation in the historically dominant Northern economies along with sustained growth in emerging countries, in particular China and India, have spurred a shift in the primary drivers in trade and growth to emerging economies with crucial implications for global demand, structures of production and innovation. In some cases, the shift in global demand to emerging economies has forced developing country suppliers to sell final goods at cheaper prices and lower level of processing than in the past, which amounts to downgrading in terms of their participation in the global economy (Kaplinsky & Farooki, Forthcoming).

These new developments represent a potential change in the center of gravity for economic growth, with significant implications for GVCs, employment and innovation, and the strategy of governments and firms in developing countries. Globalization's benefits will continue to be unevenly distributed, with its gains going to those with more education, skills, wealth, and power. However, the inclusion of large emerging economies like China, India, Brazil and Mexico among those who are benefitting, at least in part, is a qualitative shift in the process. But it does not necessarily improve the chances for smaller countries in the global economy unless they devise policies to enhance their own capabilities to foster development.

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