Economic and Social Upgrading and Workforce Development
in the Apparel Global Value Chain

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Introduction

The apparel industry is considered an important catalyst for national development, and often is
the typical starter industry for countries engaged in export-oriented industrialization due to its
low fixed costs and emphasis on labor-intensive manufacturing. The expansion of this sector
has played a critical role in the economic development of many low-income countries, which
today account for three-quarters of the world clothing exports. Formal employment in the sector
totals over 25 million in low- to mid-income economies.¹

In recent years, the apparel industry has experienced two shocks that have intensified
international competition in this sector. The first shock is regulatory: the Multi-Fiber Arrangement
(MFA), which established quotas and preferential tariffs on apparel and textile items imported by
the United States, Canada, and many European nations since the early 1970s, was phased out
by the World Trade Organization (WTO) between 1995 and 2005 via its Agreement on Textiles
and Clothing (ATC). The second crisis is economic: the global recession that began in 2008 has

¹ This brief draws from several published articles: Stacey Frederick and Gary Gereffi, “Upgrading and
Restructuring in the Global Apparel Value Chain: Why China and Asia Are Outperforming Mexico and
Central America,” International Journal of Technological Learning, Innovation and Development, Vol. 4,
Nos. 1/2/3 (2011): 67-95; Stephanie Barrientos, Gary Gereffi and Arianna Rossi, “Economic and Social
Upgrading in Global Production Networks: A New Paradigm for a Changing World,” International Labour
Gereffi, “The Apparel Global Value Chain: Economic Upgrading and Workforce Development,” Center on
Globalization, Governance & Competitiveness, Duke University, February 2011,
sector/documents/meetingdocument/kd00003.pdf.
dampened demand in the United States and other advanced industrial economies, leading to production slowdowns and plant closures in most apparel-exporting economies.

Trade restrictions have contributed to the international fragmentation of the apparel supply chain. The MFA/ATC system was designed to protect the domestic industries of the United States and the European Union (EU) by limiting imports from highly competitive suppliers. When the most competitive apparel exporters, Hong Kong, South Korea, Taiwan, and later China, reached their maximum levels under the quota system, they set up factories in less restricted nearby countries. The clothing assembly processes were sub-contracted to low-wage developing countries throughout the Asian Pacific region and elsewhere that had unused export quotas, such as Bangladesh, Sri Lanka, and Vietnam.³

As a result, during the MFA the main end markets (USA and EU-15) tended to remain fixed, but which LDCs supplied these high-income economies varied with MFA quota rules. Apparel exporters’ maintained ties with key U.S. and European markets based on the quotas they were allocated. The key issue was entry into the apparel GVC through access to quotas; once a country was in the chain, the main upgrading strategy involved shifting from assembly to full-package production. There was also some product upgrading (shift to higher end products) and process upgrading comprised of machinery and logistics investments to increase productivity and speed to market.

This system was upended by the demise of MFA and the global economic recession. The elimination of quotas and safeguards coincided with the economic crisis (2008-09) resulting in a consolidation among a limited number of large apparel exporters, while many smaller exporters were cut out of the chain. There was also significant downgrading or backsliding among Mexico and the Central American Free Trade Agreement (CAFTA) countries, due to their inability to meet Asian competition. The last two years have reinforced many of the trends occurring after the phase-out of quotas. China, Bangladesh, Vietnam, and Indonesia are increasing their market shares in North America and the European Union, primarily at the expense of near-sourcing options such as Mexico and the Central American and Caribbean suppliers to the United States.

**Leading Exporters & Shifting Global Geography in the Apparel Value Chain**

In the post-MFA market, there has been dramatic consolidation among the leading exporters. Overall, there has been increasing concentration of the top 15 apparel exporters’ share of total export trade. In 1995, the top 15 exporters accounted for 88% of all trade, and by 2011 this increased to 92%; among the top 5 exporters for each year, concentration increased from 67% in 1995 to 76% in 2011 (taking EU-15 as a whole). Figure 1 shows the top 10 apparel exporting countries from 1990 to 2011. China has been the world’s top apparel exporter since 2006, when it surpassed the total apparel exports of the European Union.

The main apparel exporting countries can be placed into the following categories:

**Increasing or Steady Global Market Share**

- **China** -- The clear winner in the global apparel export race during the past 20 years. Between 1990 and 2011, China’s share of global apparel exports increased from 9.3% to 37.4%, representing an increase in value from $10 billion to $154 billion.
- **Growth Suppliers** -- Overall, these countries have increased global market share since the early 1990s and through the economic crisis: Bangladesh, India, Vietnam, Indonesia, Sri Lanka, Pakistan, and to a lesser extent, Cambodia.
- **Steady Suppliers** -- EU-15, Turkey, Tunisia, and Morocco. These countries increased export values until the effects of the economic crisis were felt in 2009, but managed to maintain relatively stable global market shares through the quota phase-out and recession.

Decreasing Global Market Share

- **Decline with Quota Phase-Out** -- These countries experienced declines during the MFA/ATC quota phase-out (1995-2005) that have continued during the crisis: USA, Canada, Mexico, DR-CAFTA, Thailand, Romania, and Poland.
- **Past-Prime Suppliers** -- These countries were once leading apparel exporters, but their global market shares have been decreasing since the early 1990s: Hong Kong, South Korea, Taiwan, and the Philippines.

Economic Upgrading

Economic upgrading in the apparel value chain can be portrayed as a “smile curve” in which the highest value-added activities are in the pre-production (research and development, design) and post-production (brand marketing, logistics, services) stages of the production process (see Figure 2). This is true for many mature manufacturing sectors, where production activities have become relatively standardized and competition among numerous suppliers is intense.

The main stages of economic upgrading in the apparel value chain are:

1. **Assembly/Cut, Make and Trim (CMT)**: apparel manufacturers cut and sew woven or knitted fabric or knit apparel directly from yarn.

2. **Original Equipment Manufacturing (OEM)/Full Package/ Free on Board (FOB)**: the apparel manufacturer is responsible for all production activities including the CMT activities as well as finishing. The firm must have upstream logistics capabilities including procuring (sourcing and financing) the necessary raw materials, piece goods and trim needed for production.

3. **Original Design Manufacturing (ODM)/Full Package with Design**: a business model that focuses on adding design capabilities to the production of garments.

4. **Original Brand Manufacturing (OBM)**: a business model that focuses on branding and the sale of own-brand products.
Developing countries enter into the lowest segments of the value chain due to various advantages, including favorable trade agreements, low-cost labor and proximity to end markets. Bangladesh and Sri Lanka benefited significantly from preferential trade agreements with Europe and the United States, which facilitated their early entry and growth, while more recently Lesotho and Nicaragua benefited from the African Growth and Opportunity Act (AGOA) and CAFTA-DR TPL agreements, respectively.

To upgrade into higher segments of the value chain, other factors become more relevant. These include: the presence of a domestic or regional textile industry; large textile and apparel manufacturers in the country; and, in the cases of upgrading into design and branding, a strong commitment to industry growth by both the public and private sectors to develop the necessary talent and establish a national brand.

**Workforce Development**

While global expansion of the apparel industry historically has been driven by trade policy, by 2005 the Agreement on Textiles and Clothing (ATC) by the World Trade Organization had phased out many of the quotas that had previously regulated the industry. This change has brought other key factors for country competitiveness to the forefront, including labor costs, productivity and competencies. Low-cost countries such as China, India, and Bangladesh are emerging as leaders in the lower value assembly segments of the value chain, while smaller

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countries are being forced to upgrade into higher value segments, such as branding and design, that rely on high-quality human capital to maintain their competitiveness. As a result, workforce skills are increasingly important elements for developing economies to maintain and upgrade their positions in the global apparel value chain.

The majority of workers are concentrated in the production-related segments of the value chain (CMT or OEM), and historically they have mainly been young, female workers with limited education. Only 3-4% of total factory workers are not involved in assembly line positions, such as production planners, engineers, mechanical technicians and operations support. However, while the required formal skill level is relatively low in the CMT segment of the value chain, this rises rapidly as countries upgrade into higher value stages and workers with more advanced skills are needed to support new functions, such as logistics, finance, design and marketing.

Despite its potential for increasing productivity and upgrading, workforce development initiatives alone play a secondary role in improving competitiveness. Case studies in Duke CGGC’s “Skills for Upgrading” report provide several key lessons for workforce development in the apparel sector:

First, in the early stages of the value chain, there is a heavy emphasis in on-the-job training carried out by supervisors to address the skills gaps in the apparel labor force, rather than the use of formal training. This preferred method of training is less costly, but also stems from the limited number of vocational and training institutions (public or private) dedicated to the apparel industry, and the mismatch between skills provided by these institutions and private sector needs.

Second, there is frequently a shortage of skilled labor, in general, and qualified supervisors and management, in particular, to support industry upgrading in developing countries. Expatriates generally meet this skills gap or where possible, when existing skills are not present in the local labor market, certain upstream or downstream activities are performed abroad in firm headquarters.

Third, new initiatives are emerging from more mature suppliers to professionalize the apparel labor force, including managerial training to deal with growing pressures for lean manufacturing and compliance with corporate codes of conduct, and the creation of national certifications for product and process upgrading in Turkey and Sri Lanka. Initiatives such as these are important precursors to establishing comprehensive workforce standards for upgrading.

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Institutions

In those segments of the apparel value chain focused on manufacturing, the private sector has played the leading role in workforce development and most firms offer internal training of entry-level employees. There have been a number of efforts by both the public sector and donor agencies to engage technical and vocational training schools in the industry, often with only limited success.

In two countries where the industry has upgraded to higher stages of the apparel value chain (Turkey and Sri Lanka), there is significant stakeholder coordination, along with some public-private partnerships to support workforce development. These alliances include private firms, industry associations, educational institutions and the private sector to improve the quality of those skills.

Successful workforce development for ODM and OBM stages in the apparel value chain has leveraged know-how in the developed world by engaging foreign universities in successful apparel countries to help design curriculum for local programs and hiring foreign consultants to help develop talent in-house. Fostering collaboration with successful training institutions in the developed world can speed firm-level learning for upgrading, rather than relying solely on learning through experience.

The International Labor Organization (ILO) has partnered with International Finance Corporation (IFC), a branch of the World Bank, to establish the Better Work program to raise labor standards in global supply chains. While currently the Better Work program has been implemented in Cambodia, Haiti, Jordan, Lesotho, Vietnam, and most recently Nicaragua, to date the ILO-IFC partnership has focused primarily on encouraging social dialogue and improving working conditions, but thus far it has not been able to link participation by developing countries in the Better Work program to more favorable contracts or other long-term benefits with global buyers in the apparel value chain.

Factors Contributing to Economic and Social Upgrading or Downgrading

Social upgrading may occur for some workers while not for others working alongside each other in the same factory. Evidence from Morocco garments shows that highly skilled workers, even if employed in factories in the cut-make-trim segment of the apparel GVC, may have opportunities for social upgrading, especially in terms of measurable standards, when lead firms are preoccupied with their brand reputation and require compliance to labor standards in their supplier factories. At the same time, unskilled workers may be largely excluded from social upgrading in order for the factory to remain cost competitive and flexible in terms of last minute changes in orders. Challenges for social upgrading remain significant for irregular workers even as factories shift their production towards higher value added items. The new activities taken on

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by the factory may increase the value added of production and lead to social upgrading for regular workers, who may develop more skills and access training for new capabilities. However, irregular workers are needed in order to respond to buyers’ requirements in terms of low cost, short lead times and high flexibility, and yet their status impedes their social upgrading.

The case study of garment factories in Morocco participating in GVCs led by ‘fast fashion’ buyers shows that functional upgrading brings about social upgrading and downgrading simultaneously for regular and irregular workers. On the one hand, factories supplying a finished product and overseeing packaging, storage and logistics for their buyers offer stable contracts and higher social protection to their high-skilled workers to ensure a continuous relationship as well as full compliance to buyers’ codes of conduct. On the other hand, in order to quickly respond to buyers’ frequently changing orders and to operate on short lead times, they simultaneously employ irregular workers with casual contracts, especially in the final segments of the production chain (such as packaging and loading), often imposing excessive overtime as well as discriminating them on the basis of wages and treatment. 8

To maintain or advance their position in GVCs, suppliers have to engage in a balancing act between maximizing quality (to meet buyers’ standards) and minimizing costs/prices (to remain competitive to buyers). This has important implications for labor and the potential for social upgrading. Suppliers’ labor strategies in response to coping with commercial pressures can vary between a “low road” involving economic and social downgrading, a “high road” involving economic and social upgrading, as well as mixed approaches. 9 Those taking a low-road approach by worsening labor conditions risk losing out on quality. Those taking a high-road approach by improving wages and labor conditions risk losing out on price competitiveness. Therefore, many producers adopt a mixed approach of high quality and low-cost employment which facilitates both standards and cost flexibility. This is reflected in the simultaneous use of regular workers and irregular workers on any one site.

Analyzing economic and social upgrading trajectories involves understanding that economic upgrading is not always the most appropriate strategy for long term sustainability. One identified path of upgrading from integrated or “full-package” production activities (also known as original equipment manufacturing or OEM) to original design manufacturing (ODM) and original brand name manufacturing (OBM) has been very beneficial for some firms in GVCs, such as selected East Asian apparel companies. 10 However, it cannot work for everyone because risk and competition are much higher in the more advanced segments of the GVCs.

10 Gereffi (1999), op cit.
The garment industry in Eastern and Central Europe (ECE) provides an excellent example of how upgrading and downgrading trajectories have been intertwined. In the early 1980s, some of the ECE economies began to carry out outward-processing trade (OPT) for non-Soviet markets in Western Europe, primarily with German buyers and contractors. Given their legacy as established industrial economies, the emphasis on apparel exports might be considered economic downgrading. Within apparel, more advanced economies like Slovakia were able to move more quickly from OPT to full-package export production (OEM), and eventually to ODM and OBM, while less developed economies such as Bulgaria had far more difficulty moving beyond basic OPT contracting. However, in ECE economies, it was often easier to develop ODM and OBM upgrading strategies for the domestic retail market, than for more discriminating fast-fashion markets in Western Europe.11

Conclusions

The last five years have been filled with many new challenges in the global apparel value chain. The elimination of quotas and safeguards coincided with the economic crisis (2008-09) resulting in a consolidation among a relatively small number of large apparel exporters, while many smaller exporters were cut out of the chain. The last few years have reinforced many of the trends occurring after the phase-out of quotas. China, Bangladesh, Vietnam, and Indonesia are increasing their market shares in North America and the European Union, primarily at the expense of near-sourcing options such as Mexico and the Central American and Caribbean suppliers to the United States.

This paper has sought to describe and illustrate the factors that lead to economic and social upgrading in the global apparel value chain, taking into account the different levels of integration of firms and workers that can exist across industries and sectors. By more systematically analyzing the relation between economic and social up and down grading, we hope to lay the basis for more integrated research in future that incorporates both firms and workers as productive actors as well as social agents with rights.

### Table 1. Job Profiles in the Apparel Global Value Chain

<table>
<thead>
<tr>
<th>Position</th>
<th>Job Description</th>
<th>Formal Education Requirements</th>
<th>Training/Experience</th>
<th>Skill level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Sewers</td>
<td>Sew, join, reinforce, or finish, usually with needle and thread, a variety of manufactured items. Include weavers and stitchers.</td>
<td>No formal education required</td>
<td>Required experience</td>
<td></td>
</tr>
<tr>
<td>Sewing Machine Operators</td>
<td>Operate sewing machines to join, reinforce, decorate, or perform related sewing operations in the manufacture of garment or non-garment products.</td>
<td>No formal education required; literacy and numeracy skills</td>
<td>Experience; Need of speed and accuracy skills</td>
<td></td>
</tr>
<tr>
<td>Garment Pressers</td>
<td>Clothing pressers use steam irons and vacuum presses to shape garments and remove creases.</td>
<td>No formal education required</td>
<td>Experience; Need of speed and accuracy skills</td>
<td></td>
</tr>
<tr>
<td>Cutting Machine Operators</td>
<td>In automated facilities, cutters electronically send the layout to a computer-controlled cutting machine.</td>
<td>Technical education</td>
<td>Technical training</td>
<td></td>
</tr>
<tr>
<td>Line Leaders</td>
<td>Supervisory roles; assure work flows expeditiously along the line</td>
<td>High School diploma/technical education</td>
<td>Management skills</td>
<td></td>
</tr>
<tr>
<td>Production Flow Supervisors</td>
<td>Supervisory roles; oversee the pace of the work and ensure stoppages are minimized, monitor production levels, train new workers and manage constant problem solving.</td>
<td>Technical education/ Bachelor's degree</td>
<td>Management skills</td>
<td></td>
</tr>
</tbody>
</table>

**Original Equipment Manufacturer (OEM) / Full Package**

<table>
<thead>
<tr>
<th>Position</th>
<th>Job Description</th>
<th>Formal Education Requirements</th>
<th>Training/Experience</th>
<th>Skill level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Control</td>
<td>Maintain final quality prior to distribution of product, monitored by buyers</td>
<td>High School diploma/technical education</td>
<td>Knowledge of quality systems</td>
<td></td>
</tr>
<tr>
<td>Sourcing, purchasing, and supply chain management</td>
<td>Capabilities related to OEM production: workers must have financial skills related to purchasing inputs and coordinating production schedules.</td>
<td>Technical education/ Bachelor's degree in finance/management</td>
<td>Industry experience</td>
<td></td>
</tr>
</tbody>
</table>

**Original Design Manufacturer (ODM)**

<table>
<thead>
<tr>
<th>Position</th>
<th>Job Description</th>
<th>Formal Education Requirements</th>
<th>Training/Experience</th>
<th>Skill level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric and Apparel Patternmakers</td>
<td>Create the blueprint or pattern pieces for a particular apparel design. This often involves grading, or adjusting the pieces for different sized garments.</td>
<td>Technical education in apparel</td>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Tailors, Dressmakers, Custom Sewers</td>
<td>Design, make, alter, repair, or fit garments.</td>
<td>Technical education in apparel</td>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Designers</td>
<td>Workers must have training in the &quot;aesthetics&quot; of product development, some market and consumer knowledge, and technical skills required to translate ideas into samples.</td>
<td>Technical education/ Bachelor's degree in clothing design</td>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Senior Designers</td>
<td>Creative talent within the industry that can develop new design lines for production.</td>
<td>Bachelor's/Masters degree in clothing design</td>
<td>Experience</td>
<td></td>
</tr>
</tbody>
</table>

**Original Brand Manufacturers (OBM)**

<table>
<thead>
<tr>
<th>Position</th>
<th>Job Description</th>
<th>Formal Education Requirements</th>
<th>Training/Experience</th>
<th>Skill level</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Business Skills</td>
<td>Responsible for financial management supply chain optimization, quality control and/or strategy and new business development.</td>
<td>Bachelor's/Masters degree in business/ engineering</td>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Branding &amp; Marketing Capabilities</td>
<td>Responsible for market research, marketing/advertising, networking and positioning brands in the market.</td>
<td>Bachelor's/Masters degree in business</td>
<td>Marketing specialization and experience</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** CGGC, Duke University
Table 2. Upgrading Trajectories in the Apparel Global Value Chain

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Assembly/CMT (Entry in the Value Chain)** | • Assembly (Cut/Make/Trim): the focus of the supplier is on production alone; suppliers assemble inputs, following buyers’ specifications.  
  • Inputs such as textiles, accessories and packaging may be imported due to limited availability and quality concerns over local inputs.  
  • Product focus may be relatively narrow. |
| **Full Package/OEM (Functional Upgrading)** | • Firm takes on a broader range of tangible, manufacturing-related functions, such as sourcing inputs and inbound logistics as well as production.  
  • The supplier may also take on outbound distribution activities. |
| **Product Design (ODM) (Functional Upgrading)** | • Supplier carries out part of the pre-production processes such as design or product development.  
  • Design may be in collaboration with the buyer, or the buyer may attach its brand to a product designed by the supplier.  
  • In many cases, ODM firms work with designers from the lead firms to develop new products. |
| **Product Brand (OBM) (Functional Upgrading)** | • Supplier acquires post-production capabilities and is able to fully develop products under its own brand names. Two options:  
  (1) Supplier maintains a relationship with the buyer and develops brand collaboratively  
  (2) Supplier establishes its own distribution channels by establishing a new market channel that is typically more profitable and allows the firm to expand skills. These are often local or regional markets. |
| **Product Upgrading** | • Increase unit value by producing more complex products, which requires increasing the capabilities of the firm.  
  • Countries must move from low-cost commodities to higher value-added fashion goods that warrant higher returns as labor rates increase. |
| **Process Upgrading** | • Machinery: improving productivity through new capital investments.  
  • Information and Logistics Technology: improving the way the firm carries out these activities. Benefits both the firm and the chain because it reduces the total time, cost and increases the flexibility of the supply chain process. |

*Source: CGGC, Duke University.*
Table 3. Workforce Development and Upgrading in the Apparel Global Value Chain

<table>
<thead>
<tr>
<th>Assembly (Entry in the value chain)</th>
<th>Diagram</th>
<th>Workforce Development Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Production</strong> (assembly/CMT)</td>
<td><img src="image1" alt="Diagram" /></td>
<td>Reliance on in-house training provided by supervisors to ramp up new machine operators. Technical staff, such as mechanics and engineers, may benefit from additional external training programs.</td>
</tr>
<tr>
<td><strong>1.1. Skills Preparation</strong></td>
<td>On-the-job training in operation of machines, cutting and pressing equipment.</td>
<td><strong>Institutions</strong> Private sector/ Industry associations Donor agencies</td>
</tr>
<tr>
<td><strong>1.2. Institutions</strong></td>
<td>Private sector/ Industry associations Donor agencies</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OBM/ Full Package (Functional Upgrading)</th>
<th>Diagram</th>
<th>Workforce Development Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OMF/ ODM (Product Design)</strong></td>
<td><img src="image2" alt="Diagram" /></td>
<td>Firms learn buyer preferences, build relationships with textile suppliers and retail outlets. Recruit experienced employees from the textile industry. New staff hired for financial and logistics functions.</td>
</tr>
<tr>
<td><strong>2.1. Skills Preparation</strong></td>
<td>On the job training in textiles, sourcing, supply chain coordination, and logistics and cost optimization. Secondary and tertiary education.</td>
<td><strong>Institutions</strong> Private sector Educational institution</td>
</tr>
<tr>
<td><strong>2.2. Institutions</strong></td>
<td>Private sector Educational institution</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Brand (OBM) (Functional Upgrading)</th>
<th>Diagram</th>
<th>Workforce Development Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Brand (OBM)</strong></td>
<td><img src="image3" alt="Diagram" /></td>
<td>The supplier develops know-how related to brand promotion from lead buyers. Firms hire employees with skills related to marketing and consumer research. Developed country consultants can provide important training for the firm.</td>
</tr>
<tr>
<td><strong>3.2. Institutions</strong></td>
<td>Private Sector/ Industry Association Educational Institutions Government</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Upgrading</th>
<th>Diagram</th>
<th>Workforce Development Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Upgrading</strong></td>
<td><img src="image4" alt="Diagram" /></td>
<td>Suppliers begin to produce increasingly complex apparel products. These products require numerous details and are typically more complex to produce and require specific inputs.</td>
</tr>
<tr>
<td><strong>4.1. Skills Preparation</strong></td>
<td>On the job training Tertiary Education</td>
<td><strong>Institutions</strong> Private Sector Educational Institutions (Technical Schools, Universities)</td>
</tr>
<tr>
<td><strong>4.2. Institutions</strong></td>
<td>Private Sector Educational Institutions (Technical Schools, Universities)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Upgrading</th>
<th>Diagram</th>
<th>Workforce Development Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Upgrading</strong></td>
<td><img src="image5" alt="Diagram" /></td>
<td>Improves efficiency and is usually part of a low-cost strategy. Performance improvements from process upgrading: lowers operating costs in the long-run; enhances quality and delivery performance; shortens time to market.</td>
</tr>
<tr>
<td><strong>5.1. Skills Preparation</strong></td>
<td>On the job training Training for use of new equipment</td>
<td><strong>Institutions</strong> Private Sector (Suppliers and Lead firms) Government incentives for investment in training Equipment providers</td>
</tr>
<tr>
<td><strong>5.2. Institutions</strong></td>
<td>Private Sector (Suppliers and Lead firms) Government incentives for investment in training Equipment providers</td>
<td></td>
</tr>
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*Source: CGGC, Duke University.*