ABSTRACT

ZENG, LIAN. Exploring the Effect of Paying Living Wages in Apparel Sourcing from Sub-Saharan Africa and Asia. (Under the direction of Dr. Lori Rothenberg and Dr. Kristin Thoney-Barletta).

The textile and apparel industry, as an important part of trade in the world, is a labor-intensive and cost-sensitive industry. Many companies are engaged in global sourcing for lower cost and better quality because of increasing competition. Low labor costs are an important driver for companies to source from other countries, especially from developing countries. Garment workers in many parts of the world earn much less than the national average. More and more organizations and institutions promote and support payment of living wages instead of minimum wages.

A landed cost analysis of the T-shirt and denim jeans supply chains was performed for five Asian countries and five SSA countries. The landed costs of each country were compared using each type of labor wage. The analysis method used is this paper is Adikorely's (2016) adaption of Fiallos' (2009) landed cost model. It used factors, such as fabric cost, labor wages, energy, water, transportation costs, and import duty charges, to assess the effects of a living wage on the landed cost of different supply chains.

The country rankings were compared across the different labor wages. Except Ghana, SSA countries ranked best for T-shirts and denim jeans because they had the lowest landed cost when compared with Asian countries for all of the different labor wages.

The results also demonstrated that when comparing the living wages published by three sources, the Asia Floor wages are generally highest followed by the WageIndicator.org wages and then the GLWC wages. For sourcing T-shirts and denim jeans, apparel manufacturing in SSA countries was found to be cost competitive when compared to Asian countries from which

the U.S. often sources apparel, except Ghana because of its high labor wage. The labor costs in most of Sub-Saharan African countries are always lower than Asian countries. China has the highest labor wage and landed cost compared to other countries when paying different living wages. The cost competitiveness of Ethiopia decreased significantly when using WageIndicator living wages.

Exploring the Effect of Paying Living Wages in Apparel Sourcing from Sub-Saharan Africa and Asia

by
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DEDICATION

To my parents and family for always encouraging me to pursue the life I want and for being my most powerful support all of the time.

BIOGRAPHY

Lian Zeng was born in 1995 and she grew up in Chongqing, China. She earned her bachelor's degree in Fashion Design and Engineering at Donghua University in 2017. In the same year, Lian joined North Carolina State University to pursue her Masters in Textile and Apparel, Technology and Management under guidance of Dr. Lori Rothenberg and Dr. Kristin Thoney-Barletta.

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CHAPTER 1: INTRODUCTION

1.1. Background

The textile and apparel industry, as an important part of trade in the world, is a labor-intensive and cost-sensitive industry. More and more companies are engaged in global sourcing for lower cost and better quality because of the increasing competition in the textile and apparel industry. With the changes in labor cost and trade cost caused by economic and trade agreements, and the adjustments in national economic development policies, the global textile industry has experienced a shift from Europe and the United States to Asia and within Asia during the last several decades, namely, from developed countries to developing countries. According to statistics, over 80% of the world's apparel imports are sourced from developing countries (Farole & Winkler, 2014). After the establishment of the African Growth and Opportunity Act (AGOA) in 2000, which is a trade preference program with the U.S. and seeks to promote economic development in 49 Sub-Saharan African Countries (40 Sub-Saharan African Countries in 2018) by permitting eligible countries to export qualifying goods to the U.S. without import duties 2000, Sub-Saharan African (SSA) countries entered public sight in global sourcing.

Because of high production costs, especially high labor costs, the U.S. is no longer a major apparel manufacturer but is one of the largest apparel consumption markets in the world. U.S. textile and apparel businesses have participated in global sourcing for more than six decades (Ha-Brookshire, 2015). Textile and apparel imports into the United States (U.S.) from the world have increased from $26.7 billion in 1989 to $105.9 billion in 2017. Textile and apparel imports into the U.S. from Asia have increased from $19.3 billion in 1989 to $81.9 billion in 2017 (OTEXA, 2018). Due to the increase of labor cost in Asia recently and the establishment of the

African Growth and Opportunity Act (AGOA), many companies in the U.S. are considering changing their sourcing to Africa. Trade data shows that textile and apparel imports into the U.S. from Africa have increased from $252.3 million in 1989 to $2.2 billion in 2017 (OTEXA, 2018).

Low labor cost is an important driver for companies to source from other countries, especially from developing countries. Garment production can be easily dispersed. Companies in developed countries can outsource to developing countries, and those in developing countries can move production within and between countries in search of cheaper labor (Women in Informal Employment: Globalizing and Organizin, 2018). Statistics from Public Radio International (PRI) show that garment workers in many parts of the world earn much less than the national average (Lu, 2018b). Asia is the major apparel manufacturer. According to the ILO report, even though Asia garment worker's wages are rising, they remain low (Barrie, 2017). Low wages, "flexible" contracts (or no contracts), and sweatshop conditions become the main challenges of global manufacturing in the garment industry (Women in Informal Employment: Globalizing and Organizin, 2018).

1.2. Problem Statement

Even though successful and responsible global sourcing is beneficial to businesses and consumers, as seen in the availability of a variety of high-quality products at affordable prices, it has been criticized for focusing too much attention on profits and contributing to overconsumption (Ha-Brookshire, 2015). On March 20, 1987, the Brundtland Commission of the United Nations (UN) published a document called Report of the World Commission on Environment and Development: Our Common Future. In this report, sustainable development was defined as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987, p54). It requires organizations and businesses to consider balancing economic, environmental, and social goals simultaneously to meet present needs without compromising the needs of future generations.

Labor wages are not only mentioned as a criteria considered in sourcing selection, but are also mentioned in sustainability, especially in discussions of social goals, or social sustainability. In global sourcing, many companies just provide the legal minimum labor wage in order to reduce cost, which leaves workers around the world in poverty. As a result, the topic of a living wage has exploded into public consciousness. The living wage allows a worker to afford a decent standard of living for his or her family, with a little extra “just in case" (Ha-Brookshire, 2015). More and more organizations and institutions promote and support payment of living wages. They believe that paying a living wage, instead of a minimum wage, will allow workers to support a family and achieve meaningful participation in society through recreation and savings for the future (Shelburne, 1999).

1.3. Research Objective

The purpose of this study is to assess the effects of a living wage versus a minimum wage on the landed cost of different supply chains with apparel production in Sub-Saharan Africa and Asia. The specific objectives of the research are:

1) To compare different wages on landed costs;

2) To determine how country rankings change depending on the wage that is selected.

1.4. Research Value

This research provides an in-depth exploration of the performance of different supply chains which can contribute to identifying opportunities for textile and apparel production in Asia and SSA and improving retail and brand sourcing practices. The application of a specific landed cost model, Fiallos' cost model, will help sourcers understanding the implications of paying a minimum versus a living wage in the context of all costs (Fiallos, 2009). By calculating the complete landed cost, buyers in the U.S. are given a comprehensive picture to help them better develop their sourcing strategy.

From a social responsibility perspective, this research is significant in its potential to promote and motivate the development of social sustainability in the textile and apparel industry. Society should be called upon to make a fair and decent world through addressing the labor issue in sourcing.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews the literature on supplier selection criteria and evaluation in the textile and apparel industry, labor wages, and textile and apparel cost models. Section 2.1 is a literature review on criteria for supplier selection and evaluation in textile and apparel industry. In Section 2.2, literature on minimum wages and living wages is explained. This section mainly discusses the development of labor wages. Section 2.3 reviews literature on cost methods used in the textile and apparel industry. Section 2.4 presents Max Fiallos' (2009) cost model, with the equations used in determining costs in the apparel supply chain.

2.1. Criteria for Supplier Selection and Evaluation in Textile and Apparel Industry

2.1.1. Criteria for Supplier Selection

Dickson (1966) identified 23 criteria for vendor selection in terms of the importance by surveying 273 purchasing agents and managers selected from the membership list of the National Association of purchasing managers. Ranked according to importance from highest to lowest, these criteria were quality, delivery, performance history, warranties and claim policies, production and facilities, technical capability, financial position, procedural compliance, communication system, reputation and position in industry, desire for business, management and organization, operating controls, repair service, attitude, impression, packaging ability, labor relations record, geographical location, amount of past business, training aids, and reciprocal arrangements.

Weber, Current and Benton (1991) reviewed, annotated and categorized 74 articles which have appeared since 1966 into one of the twenty-three criteria concluded by Dickson (1966). They found 64% articles discussed more than one criteria because of the inherently multi-objective nature of the vendors' selection decisions. Net price, delivery, and quality were the top three significant criteria discussed in the literature. They also discovered that quality and delivery were the most important criteria when it comes to selecting a vendor for Just in Time (JIT) manufacturing, while the importance of geographical location in JIT systems was noted in contrast to that in Dickson's report.

De Boer, Labro, and Morlacchi (2001) presented a framework which contains four steps (problem definition, formulation of criteria, pre-qualification and final choice) in the supplier selection process and accommodates diverse situations, in terms of complexity and importance. Based on this framework, De Boer et al. (2001) did an extensive search in the academic literature on different methods used in decision making for supplier selection and grouped them into one of the four steps. From the analysis, they pointed out that the four steps in the supplier selection process were all vital for sound decision making, and different projects (i.e. different sectors, different products or different services) require different evaluation criteria. In addition, they stated that the suitability of a certain method was more dependent on the more generic, situational characteristics, such as the number of suppliers available, the availability of historic information, and the importance of the buy, as well as the phasing and organisation of the whole supplier selection process.

Huang and Keskar (2007) provided a comprehensive list of supplier selection criteria by hierarchically arranging seven categories of metrics (reliability, responsiveness, flexibility, cost and financial, assets and infrastructure, safety, and environment) into three tracks: product related (e.g. make to stock, make to order, or engineer to order), supplier related (e.g. local or global) and social related. Huang and Keskar (2007) stated that an appropriate set of metrics used to measure the performance of a supplier can be selectively configured by management depending on a firm's business strategy to make an optimal supplier selection decision and achieve a strategic fit between the firm's business model and its supply chain strategy.

Govindan, Rajendran, Sarkis, and Murugesan (2015) analyzed thirty-three research studies appearing from 1996 to 2011 that focus on green supplier selection. They found that most of the recent studies took both traditional and ecological criteria into consideration for supplier selection. The major criteria considered are environmental management system and quality. Other potential drivers, like the global supply chain management capabilities, strategic level of purchasing department, the level of environmental commitment, degree of green supplier assessment and degree of green supplier collaboration, were also discussed in some studies. Govindan, et al. (2015) documented that it was difficult to include environmental aspects in the supplier selection process, and more generic and encompassing criteria (e.g. environmental management systems implementation) were more acceptable due to their flexibility.

Weber, Current and Benton (1991) researched and grouped different quantitative approaches to supplier selection presented in the literature into three general categories: (1) linear weighting models; (2) mathematical programming models; and (3) statistical/probabilistic approaches. Huang and Keskar (2007) found that a large number of decision-making methodologies used are basically variations of optimization methods, including Analytical Hierarchy Process (AHP)-based methods, Multi-Attribute Utility Theory (MAUT)-based methods, and ranking methods.

2.1.2. Supplier Evaluation in Textile and Apparel Industry

Teng and Jaramillo (2005) pointed out that price was no longer the only criteria for selecting and evaluating suppliers in the textile and apparel industry. So they developed a model consisting of delivery, flexibility, cost, quality and reliability by adopting an analytical hierarchy process model and multiple attribute utility theory approach. They used this model to calculate the total criteria score of three suppliers located in Mexico, South America and China to determine their performance, and found Chinese suppliers were more competitive than the suppliers from South America and Mexico. However, there was a very small difference between the score of the suppliers from China and South America. The Chinese supplier had a lower product price and better quality, while the South American supplier had a better currency policy and logistic infrastructure.

For providing an in-depth understanding of U.S. apparel manufacturers' global sourcing practices, Teng and Jaramillo (2005) examined different criteria (lower price, higher quality, technology access, lead time, and criteria related to sourcing countries, such as absence of labor disputes, proximity to market, and cultural similarity) and the benefits and challenges of global sourcing based on two firm characteristics (sourcing items and top management commitment). Previous research indicated that the importance of supplier selection criteria differed from sourcing domestically to internationally. Lead time was vital for domestic sourcing firms, while for overseas sourcing firms, the most important criterion was cost. In Jin and Farr's study, they found that for sourcing basic items, the most important criteria was cost, while for sourcing fashion items, the most important criteria was lead time. Firms performed better in global sourcing when their top management placed strong commitment on sourcing country.

Kim (2012) analyzed the global sourcing strategy of the South Korean apparel industry from the perspective of buyers and suppliers. They collected data from trade paper reviews. They found there were three areas of focus in global sourcing: cost minimization, competitive advantage, and strategic assets. The most significant factor when South Korean apparel companies formulated global sourcing strategies was production cost, specifically labor wages. It was also important to understand differences in culture, society, and politics for maintaining stable partnerships building, trust with supplier countries and surviving in an environment in which suppliers change rapidly.

Baskaran, Nachiappan, and Rahman (2012) employed the grey approach to analyze suppliers within the Indian textile and clothing industry (both garment manufacturers and ancillary suppliers) using sustainability criteria. The grey approach proposed is a new mathematical method which considers the condition of the fuzziness and flexibility in dealing with inconsistent information in group decision-making situations A sample of sixty-three suppliers and six sustainability criteria (e.g. discrimination, abuse of human right, child labor, long working hours, unfair competition, and pollution) was evaluated. The results indicated that the criterion of long working hours is vital for both categories of suppliers. For garment manufacturers, pollution and unfair competition were the most important criteria. For ancillary suppliers, employing child labor was found to be a critical criterion.

In Winter and Lasch's (2016) research, purchasing experts from the fashion and apparel industry were interviewed to examine how companies apply environmental and social criteria in supplier evaluation. They discovered that sustainability criteria were applied in pre-qualification and to verify compliance, but they were not important in the final selection of a supplier for an order as is often recommended in the literature.

Kargi and Manisa (2016) used fuzzy and multiple-criteria decision making methods to evaluate three suppliers and identify the most suitable yarn supplier from various alternatives. According to the information in the literature and the opinions of the decision makers of the company, five decision criteria were selected to evaluate the supplier alternatives. Based on the decision-makers opinions, it was determined that the relative importance weights of the decision criteria, ranked from the highest to the lowest, were quality, delivery time, pricing, technology and flexibility.

Erfaisalsyah, Mansur, and Khasanah (2017) integrated the Analytical Hierarchy Process (AHP) and the Standardized Unitless Rating (SUR) to assess the performance of four raw material suppliers of yarn and identify the best one. They analyzed seven criteria as the assessment parameter, which were quality, cost, delivery, flexibility, responsiveness, company's relationship with suppliers, and supplier's environmental management system. The results show the most important criteria is quality followed by order price, delivery, response, flexibility and the company's relationship with suppliers. Environmental management system ranked last.

2.2. Minimum Wage vs. Living Wage

2.2.1. Minimum Wage Legislation and Impact

A minimum wage is defined as the lowest hourly/daily/monthly wage that can be legally paid to workers. Minimum wage laws were first published in Australia and New Zealand to raise the income of unskilled workers. More and more modern, developed economies and underdeveloped economies have enforced a national minimum wage (Staff, 2007). The purpose of minimum wage legislation was the elimination of extreme poverty (Stigler, 1946). There are two common methods to set national minimum wages: one is through government legislation, and the other is through collective bargaining agreements. Scholars have found that minimum wages legislated by governments are lower than wage floors set within collective agreements (Boeri, 2012).

The minimum wage is considered by many politicians to be a powerful and effective anti-poverty tool mainly in employment and wage distribution (Sabia & Burkhauser, 2010; Kapelyuk, 2015). Kapelyuk (2015) suggested that minimum wage increases contributed to a reduction in poverty, yet the size of this effect was moderate. Wage changing is likely to affect the industry with high demand elasticity. The question of how a minimum wage influences employment not only remains one of the most widely studied and most controversial topics in labor economics but is also a contentious hotspot in the political sphere (Meer & West, 2016). From the macroeconomic perspective, employers are likely to demand less labor as the price of labor increases (Boeri, 2012; Meer & West, 2016). However, after testing this prediction, many recent studies discovered a negligible effect of minimum wage increases on the level of employment (Zavodny, 2000; Neumark, 2008; Giuliano, 2013; Meer & West, 2016). The possibility that minimum wages can reduce poverty largely relies on whether low-wage workers are concentrated in poor households (Kapelyuk, 2015). Gindling and Terrell (2010) found that there was no indication that minimum wages influenced the distribution of wages in three sectors (small firms in the private sector/self-employed sector/the public sector), and minimum wages only had an effect on wage distribution in large firms in the private sector.

In terms of firm profitability, Draca and Van Reenen (2011) defined the high-market power industries as those with higher than median value of the industry-level Lerner Index in firm's three-digit industry, and suggested that increasing the minimum wage significantly cut down on profitability (especially in industries with relatively high-market power), and in industries with relatively high-market power, the rate of profit decline was large, but it had no impact on employment or productivity. Bell and Machin (2018) found a significant fall in the stock market value of low-wage firms when minimum wages were significantly increased. Sabia (2015) found that if the minimum wage was increased by 10%, there was a short-run 1% to 2% decline in state GDP generated by lower-skilled industries relative to more highly skilled industries. Kuroki's research (2018) showed that raising minimum wages can largely increase life satisfaction of workers without a high school diploma. A higher minimum wage might be able to raise the well-being of low-skilled workers without hurting business owners.

Many studies also found some links between minimum wages and health outcomes. Some claimed that having a national minimum wage significantly improved several measures of health by changing health behaviors, leisure expenditures, and financial stress (Grossman, 1972; Leigh, 2013; Lenhart, 2017). Paul Leigh, Leigh, and Du (2019) found that as the minimum wage increased, smoking prevalence among low-wage/low-skilled workers was reduced. They also found that there were no consistent associations between minimum wages and health outcomes and no consistently harmful health effects because of increases.

2.2.2. Living Wage

The concept of living wages which enables workers to buy basic necessities rather than just surviving, first emerged in Brition during the 1870s. “In 1894, Oldroyd further defined the definition of living wage as the income necessary to offer workers and their families the basic necessities of life, to enable workers to live with dignity and to give workers opportunity of participation as active citizens in society (Wills, 2009; Wait, 2013).”

In the beginning of the twentieth century, social reformers and industrialists sought to calculate real living wages (Wills, 2009). According to CARR et al. (2016), “There are at least three such approaches, based on: (1) basic living costs, which use official, often government, cost-of-living estimates for food baskets, rent and pension payments; (2) income distribution, which uses a percentage of median income; or (3) an average of (1) and (2), perhaps with a buffer to allow for unexpected shocks, inflation and so forth.” From 1925, the Independent Labor Party added living wage into the official policy. In February 1931, a living wage bill was proposed in the House of Commons (Wills, 2009). However, the way of exploration and discussion on living wage was long and rough. The concept of living wage did not come into public's view again as the official demand until 2001 when the London Citizen led the call and campaign (Wills, 2009). According to the record of the Living Wage Foundation (2012), "since 2001 an estimated 10,000 people in London have gained the living wage, with over £96 million having been added to pay". In 2011, the Trust for London, the Living Wage Foundation, the Faire Pay Network, and FairePension worked together to called for adoption of living wage, which given a new boost to the living wage (Bennett, 2012).

Bennett (2012), Prowse and Fells (2016) illustrated that it was necessary to devise a formula to calculate a specific amount of living wage. However, different methods, complex technical formulas, and updated living wages all limited the spread and development of living wages. The Asia Floor Wage has failed to promote a common and coordinated regional approach to living wages in Cambodia or Indonesia because of different national economic, political and institutional contexts (Ford & Gillan, 2017). To deal with the problem of low pay, Prowse and Fells (2016) pointed out that there was a need for further research on the flow-on effects, the relative influence of community, social and other pressures on private sector employers compared to the public sector, and policy making in relation to minimum and living wages. Bennett (2012) thought that we cannot use family needs as the standard, but instead should use the individual need, because there are many potential factors that may lead to poverty in a household with one or two earners.

A "business-assistance" living wage law was passed primarily in large central cities with relatively progressive governing regimes in the Northeast or on the West Coast in the times of national political gridlock and the Great Recession for promoting employment, solving the problem of poverty in urban areas, and changing the dominant practice of economic development

(William Lester, 2012). In William Lester's study (2012), he claimed that there was no evidence to show that business assistance living wage laws reduce employment or redevelopment activity. Furthermore, it can create jobs of greater quality by using living wage ordinances. In addition, he also pointed out that in study that it didn't have the direct relationship between the increases in workers' wages and the application of a business assistance living wage.

Wait (2013) pointed out that paying living wage had a huge influence on worker productivity, satisfaction and staff turnover. The costs of paying a living wage to employees was offset eventually as a result of the increase of worker productivity and satisfaction, and the decrease of staff turnover. He also claimed that there is no obvious relationship between paying living wages and employment. Zeng and Honig (2017) investigated the impact of living wages on workers' attitudinal and behavioral outcomes. They found that paying living wages may be beneficial for both employers and employees. The positive attitude and behavior of the employee due to the payment of living wages contributed to a significantly higher effective commitment and a lower turnover intention compared to minimum wage workers, which is very important for long-term business development.

Unlike many of the leading popular and philosophical arguments that employers had a duty to pay a living wage, Brennan (2017) believes that paying living wages is a voluntary rather than mandatory, which means employers do not owe employees a living wage. He thinks that it is impossible to pay most workers around the world a living wage under the current levels of economic development, and most of the burden should fall upon the government, not the employers. For example, there should be more taxes and redistribution to make certain markets more competitive.

2.3. Costing Methods Used in the Textile and Apparel Industry

Hergeth (1996) describes the different product-costing systems in the textile industry: conventional methods, activity-based costing and strategic cost management. The conventional method pays attention to direct costs during the manufacturing process and used in predicting the cost of new orders. However, this method cannot explain the differences in order size and production steps, which can lead to an over or under estimation of the cost of products. Activity-based costing includes all of the costs involved in the processing of a product until it is sold, including manufacturing overhead. Strategic cost management helps companies in decision making when they are in a competitive market by including activity-based costing and going further to include the effect of the product on the rest of the company.

Rendall, Hergeth, Chen and Zuckerman (1999) conducted a field study and a survey to determine the types of costing tools and practices used by textile companies. Rendall et al. (1999) found that most textile companies still used old or traditional costing methods, which have no way of controlling the high manufacturing cost like contemporary costing practices. Some companies are certainly more inclined to consider implementation of contemporary cost management practices than others, which can allow for benchmarking and improvements in cost, quality, and delivery time along the entire supply chain.

Fiallos (2009) developed a detailed cost model for sourcing knit cotton T-shirts and denim jeans from six countries. His research attached importance to landed costs and lead time issues along the supply chain. By modeling the supply chain from fiber to garment production, as well as transporting the final product to the US and paying US duties, if applicable, Fiallos (2009) found that the least expensive countries from which to source T- shirts were China and India, while for denim jeans, China and Guatemala were the least expensive. A 15% export tax rebate on the exit factory price of garments provided by the Chinese government largely enhanced the competitiveness of Chinese manufacturers. Factors such as access to raw material, labor costs, Free Trade Agreements (FTA), and government subsidies all can affect the total landed cost of apparel products.

2.4. Fiallos' Cost Model (Adikorely et al., 2016)

Fiallos (2009) developed a detailed model for calculating the landed cost of knit T-shirts and woven denim jeans. In this section, his cost model and all related parameters are explained and then how he applied the model to sourcing knit T-shirts and woven jeans from six countries (China, Colombia, Guatemala, India, U.S. and Vietnam) is discussed.

In Fiallos' (2009) research, for countries like China, the US and India which were analyzed in the 2008 ITMF IPCC report, he assumed that the yarn used for making the fabric of T-shirts and denim jeans was produced in an ITMF country. Then the yarn was shipped to where greige fabric was produced through knitting or weaving, followed by dyeing and fabric finishing, cut and sew operations, and garment finishing, if necessary. Guatemala, Colombia and Vietnam, which were not analyzed in the 2008 ITMF IPCC report. Guatemala and Colombia were assumed to use yarn from the US, while Vietnam was assumed to use yarn from China. The following steps in the production process for these countries were the same as for the ITMF countries.

The landed cost of sourcing a product from a given country is the sum of the exit Free on Board (FOB) cost plus the garment transportation cost and duty cost, as shown in Equation 2.1.

Equation 2.1 - Landed Cost

$$\frac{\$}{garment} = \frac{\$_{FOB}}{garment} + \frac{\$_{garment\ transportation}}{garment} + \frac{\$_{duty}}{garment}$$

2.4.1. Exit FOB Cost

The FOB value, as shown in Equation 2.2, included the exit-factory cost and rebate. Equation 2.3 shows the calculation for Export Tax Rebate. Fiallos (2009) explained that the governments of some countries offer apparel manufacturers rebates or subsidies on exports to enhance the country's competitiveness in global markets to promote trade. For example, one of the countries included in this study, China, provided a 15% rebate on the exit-factory cost in 2009.

Equation 2.2 - FOB Value

$$\frac{\$_{FOB}}{garment} = \frac{\$_{exit-factory}}{garment} - \frac{\$_{rebate}}{garment}$$

Equation 2.3 - Export Tax Rebate

$$\frac{\$_{rebate}}{garment} = \frac{\$_{exit-factory}}{garment} \times Rate_{rebate}$$

The exit-factory cost includes the costs of fabric, trim, apparel labor, apparel energy, garment finishing, off-quality, and capital costs as shown in Equation 2.4. The cost of garment finishing only applies to the denim jeans.

Equation 2.4 - Exit-factory Cost

$$\frac{\$_{exit-factory}}{garment} = \frac{\$_{fabric}}{garment} + \frac{\$_{trim}}{garment} + \frac{\$_{labor}}{garment} + \frac{\$_{energy}}{garment} + \frac{\$_{garment\ finishing}}{garment} + \frac{\$_{off-quality}}{garment} + \frac{\$_{capital}}{garment}$$

2.4.1.1. Total Fabric Cost

Equation 2.5 shows the calculation for fabric cost per meter by adding the cost of greige fabric, and the subsequent costs of wet processing and finishing.

Equation 2.5 - Fabric Cost in $ per Meter Including Dyeing and Finishing

$$\frac{\$_{fabric\ cost}}{m_{fabric}} = \frac{\$_{greige}}{m_{fabric}} + \frac{\$_{dyeing}}{m_{fabric}} + \frac{\$_{finishing}}{m_{fabric}}$$

Fiallos (2009) took the spread loss and the width of the fabric into consideration when determining the fabric cost for knit a T-shirt. He set a spread loss of 0.8 percent and assumed that a tubular knit fabric with an average width of 0.5588 meters (22 inches) and a length of 0.9906 meters was used to produce one T-shirt. Because the knit fabric in the ITMF report was an open width fabric of 1.92 meters, the cost needed to be converted. Equation 2.6 shows that conversion, where $width_{new}$ is 0.5588 meters and $width_{original}$ is 0.96 meters.

Equation 2.6 - Fabric Cost per T-shirt

$$\frac{\$_{fabric}}{garment} = \frac{\$_{fabric}}{m_{fabric}} \times \frac{m_{fabric}}{garment} \times (1 + loss_{spread}) \times \frac{width_{new}}{width_{original}}$$

A spread loss of 3 percent, a fabric width of 1.68 meters, and a length of 1.5453 meters were used to produce a pair of denim jeans. Equation 2.7 shows the fabric cost for denim jeans.

Equation 2.7 - Fabric Cost per Pair of Denim Jeans

$$\frac{\$_{fabric}}{garment} = \frac{\$_{fabric}}{m_{fabric}} \times \frac{m_{fabric}}{garment} \times (1 + loss_{spread})$$

2.4.1.1.1. Greige Fabric Cost

The cost of greige fabric, as shown in Equation 2.8 and 2.9, is the sum of the labor cost, energy cost, auxiliary material cost, capital cost, waste cost and yarn cost. For the knitted greige fabric, the cost of waste was not included.

Equation 2.8 - Greige Fabric Manufacturing Cost

$$\frac{\$_{greige}}{m_{fabric}} = \frac{greige\ labor}{m_{fabric}} + \frac{greige\ energy}{m_{fabric}} + \frac{greige\ auxilliary\ material}{m_{fabric}} + \frac{greige\ capital}{m_{fabric}} + \frac{greige\ waste}{m_{fabric}} + \frac{\$_{yarn}}{m_{fabric}}$$

Equation 2.9 - Cost Calculation for Non-ITMF Country

$$\frac{\$_{Greige}}{m_{fabric}} = \left(\sum \frac{labor\ rate_{non-ITMF\ country}}{labor\ rate_{ITMF\ country\ i}} \times \frac{\$_{cost\ component}}{m_{ITMF\ country}}\right) \div 3$$

For the ITMF countries, the yarn cost was calculated from the 2008 ITMF IPCC report using Equation 2.10. For the non-ITMF countries, the yarn cost was the sum of the yarn cost of the ITMF country that produced the yarn and the cost of shipping the yarn in a 40-foot container from the yarn producing country to the non-ITMF country. The calculation for the yarn cost of the non-ITMF countries is shown in Equation 2.11. It was assumed that 16,646.84 kg of yarn could fit into a 40-foot container.

Equation 2.10 - Yarn Costs in \$ per Meter of Fabric

$$\frac{\$_{yarn}}{m_{fabric}} = \frac{\$_{yarn}}{kg_{yarn}} \times \frac{kg_{yarn}}{m_{fabric}}$$

Equation 2.11 - Yarn Costs Including Shipping Costs in \$ per Meter of Fabric

$$\frac{\$_{yarn}}{m_{fabric}} = \left(\frac{container}{kg_{yarn}} \times \frac{\$}{container} \times \frac{kg_{yarn}}{m_{fabric}}\right) + \left(\frac{\$_{yarn}}{kg} \times \frac{kg_{yarn}}{m_{fabric}} \times (1 + Insurance\ Rate)\right)$$

Fiallos (2009) assumed that Ne 6 would be used in denim production instead of Ne 20 which was reported in the ITMF IPCC 2008. Since the open-end yarn (Ne 20) was finer than typical yarns used for the production of denim, Fiallos (2009) computed the amount of yarn that would be used in weaving fabric from Ne 6 yarn, using the desired fabric weight of 0.4238 kg/m^2 and the width of the fabric in the ITMF IPCC report. This computation is shown in Equation 2.12.

Equation 2.12 - Kilogram of Yarn per Meter of Woven Fabric

$$\frac{kg_{yarn}}{m_{fabric}} = \frac{kg_{yarn}}{m^2{}_{fabric}} \times \, width_{fabric}$$

2.4.1.1.2. Fabric Dyeing Cost

2.4.1.1.2.1. Dyeing Cost for Knit Fabric

Piece dyeing operating data including labor, chemical, dyes, water, steam, and electric consumption rates for a typical plant setup was provided by a dyeing machine company for scouring and dyeing 100% cotton piece goods with a dark shade. Fiallos (2009) used this information to determine the dyeing cost for knit fabric. Table 2.1 shows the resource consumption provided by the company for processing the fabric on a 2-strand Millennium Dyeing Machine with Charge Tank using reactive dyes. This machine has an output rate of 188 pounds of fabric per hour. Equations 2.13 through 2.17 are used to calculate the cost of labor, energy, steam, water, and chemicals and dyes for piece dyeing per pound of dyed fabric. Equation 2.18 is the sum of these costs per pound of dyed fabric. Equation 2.19 is the dyeing cost converted to dollars per meter of knit fabric.

Table 2.1: Resource Consumption for Piece Dyeing Knit Fabric

Component	Quantity	Units
Labor	1/3	operators/machine
Energy	0.0853	kWh/lb_{fabric}
Steam	2.13	lb_{steam}/lb_{fabric}
Water	4.8	gln_{water}/lb_{fabric}
Chemicals	0.0874	$\$_{chemical}/lb_{yarn}$
Dyes	0.6818	$\$_{dyes}/lb_{yarn}$

Equation 2.13 - Labor Cost for Piece Dyeing in $ per Pound of Knit Fabric

$$\frac{\$_{dye\ labor}}{lb_{fabric}} = \frac{\$_{labor}}{hr} \times \frac{operators}{machine} \times \frac{hr}{lbs_{output}}$$

Equation 2.14 - Energy Cost for Piece Dyeing in $ per Pound of Knit Fabric

$$\frac{\$_{dye\ energy}}{lb_{fabric}} = \frac{kWh}{lb_{fabric}} \times \frac{\$}{kWh}$$

Equation 2.15 - Steam Cost for Piece Dyeing in $ per Pound of Knit Fabric

$$\frac{\$_{dye\ steam}}{lb_{fabric}} = \frac{lb_{steam}}{lb_{fabric}} \times \frac{\$}{lb_{steam}}$$

Equation 2.16 - Water Cost for Piece Dyeing in $ per Pound of Knit Fabric

$$\frac{\$_{dye\ water}}{lb_{fabric}} = \frac{gln_{water}}{lb_{fabric}} \times \frac{\$}{gln_{water}}$$

Equation 2.17 - Chemical and Dye Cost for Piece Dyeing in $ per Pound of Knit Fabric

$$\frac{\$_{dye\ \&\ chemical}}{lb_{fabric}} = \frac{\$_{chemicals}}{lb_{fabric}} + \frac{\$_{dyes}}{lb_{fabric}}$$

Equation 2.18 - Dyeing Cost in \$ per Pound of Knit Fabric

$$\frac{\$_{dyeing}}{lb_{fabric}} = \frac{\$_{dye\ labor}}{lb_{fabric}} + \frac{\$_{dye\ energy}}{lb_{fabric}} + \frac{\$_{dye\ steam}}{lb_{fabric}} + \frac{\$_{dye\ water}}{lb_{fabric}} + \frac{\$_{dye\ \&\ chemical}}{lb_{fabric}}$$

Equation 2.19 - Dyeing Cost in \$ per Meter of Knit Fabric

$$\frac{\$_{dyeing}}{m_{fabric}} = \frac{\$_{dyeing}}{lb_{fabric}} \times \frac{kg_{fabric}}{m_{fabric}} \times \frac{2.2046 lb_{fabric}}{kg_{fabric}}$$

2.4.1.1.2.2. Dyeing Cost for Woven Fabric

Fiallos (2009) consulted three textile machine and manufacturing companies to calculate the yarn dyeing cost for the woven fabric used for denim jeans. Data for operating an indigo rope dyeing range including labor, electric, steam, and water consumption rates for a typical plant setup, and cost information for preparation, dyeing, and yarn lubrication for a 2% shade were provided by these companies. Fiallos (2009) used the information to calculate the dyeing cost for the woven fabric used for denim jeans. Table 2.2 shows the resource consumption provided by three companies for a basic indigo rope range with an output rate of 3702.9 pounds of fabric per hour. Equations 2.20 through 2.24 are used to calculate the cost of labor, energy, steam, water, and chemical and dyeing for rope dyeing per pound of dyed warp yarn. Equation 2.25 is the sum of these cost per pound of dyed warp yarn. Equation 2.26 is the dyeing cost converted to dollars per meter of woven fabric.

Table 2.2: Resource Consumption for Rope Dyeing

Component	Quantity	Units
Labor	3	operators/machine
Energy	57.5	kW
Steam	2930	kg_{steam}/hr
Water	19.8	$m^3{}_{water}/hr$
Chemicals	0.0824	$\$_{chemical}/lb_{yarn}$
Dyes	0.0556	$\$_{dyes}/lb_{yarn}$

Equation 2.20 - Labor Cost for Rope Dyeing in $ per Pound of Dyed Warp Yarns

$$\frac{\$_{dye\ labor}}{lb_{yarn}} = \frac{\$_{labor}}{hr} \times \frac{operators}{machine} \times \frac{hr}{lbs_{output}}$$

Equation 2.21 - Energy Cost for Rope Dyeing in $ per Pound of Dyed Warp Yarns

$$\frac{\$_{dye\ energy}}{lb_{yarn}} = \frac{\$}{kWh} \times kW \times \frac{hr}{lbs_{output}}$$

Equation 2.22 - Steam Cost for Rope Dyeing in $ per Pound of Dyed Warp Yarns

$$\frac{\$_{dye\ steam}}{lb_{yarn}} = \frac{\$}{lb_{steam}} \times \frac{kg_{steam}}{hr} \times \frac{hr}{lbs_{output}}$$

Equation 2.23 - Water Cost for Rope Dyeing in $ per Pound of Dyed Warp Yarns

$$\frac{\$_{dye\ water}}{lb_{yarn}} = \frac{\$}{m^3{}_{water}} \times \frac{m^3{}_{water}}{hr} \times \frac{hr}{lbs_{output}}$$

Equation 2.24 - Chemical and Dye Cost for Rope Dyeing in $ per Pound of Dyed Warp Yarns

$$\frac{\$_{dye\ \&\ chemical}}{lb_{yarn}} = \frac{\$_{chemicals}}{lb_{yarn}} + \frac{\$_{dyes}}{lb_{yarn}}$$

Equation 2.25 - Yarn Dyeing Cost for Rope Dyeing in $ per Pound of Dyed Warp Yarns

$$\frac{\$_{dyeing}}{lb_{yarn}} = \frac{\$_{dye\ labor}}{lb_{yarn}} + \frac{\$_{dye\ energy}}{lb_{yarn}} + \frac{\$_{dye\ steam}}{lb_{yarn}} + \frac{\$_{dye\ water}}{lb_{yarn}} + \frac{\$_{dye\ \&\ chemical}}{lb_{yarn}}$$

Equation 2.26 - Dyeing Cost in $ per Meter of Woven Fabric

$$\frac{\$_{dyeing}}{m_{fabric}} = \left(\frac{4032\ ends}{m_{fabric}} \times \frac{m_{yarn}}{end} \times \frac{1.0936\ yds_{yarn}}{m_{yarn}} \times \frac{lb_{yarn}}{6\ X\ 840yds_{yarn}} \times \frac{\$_{dyeing}}{lb_{yarn}}\right)$$
$$\div\ 0.6_{weave\ factor} = \left(\frac{0.87488\ lb_{yarn}}{m_{fabric}} \times \frac{\$_{dyeing}}{lb_{yarn}}\right) \div 0.6_{weave\ factor}$$

2.4.1.1.3. Fabric Finishing Cost

The finishing step includes the cost of finishing the fabric mainly through drying and compacting for both knit and woven fabric. The main parameters of the finishing cost are the cost of labor, energy and steam.

2.4.1.1.3.1. Finishing Cost for Knit Fabric

Fiallos (2009) used the information on resource consumption from Biancalani's Spyra 10 machine which was taken as the base for drying and compacting of knits to determine the finishing cost for knit fabric. He assumed that the output rate was 1140 meters per hour. Table 2.3 shows the resource consumption for this machine. Fiallos (2009) used Equations 2.27 through 2.29 to calculate the per meter cost of labor, energy and steam for drying and compacting the fabric. Equation 2.30 is a sum of all of the cost factors for finishing the knit fabric.

Table 2.3: Resource Consumption for Knit Fabric Finishing

Component	Quantity	Units
Labor	1	operators/machine
Energy	80	kW
Steam	1400	kg_{steam}/hr

Equation 2.27 - Labor Cost for Finishing in $ per Meter of Fabric

$$\frac{\$_{finish\ labor}}{m_{fabric}} = \frac{operators}{machine} \times \frac{\$_{labor}}{hr} \times \frac{hr}{m_{output}}$$

Equation 2.28 - Energy Cost for Finishing in $ per Meter of Fabric

$$\frac{\$_{finish\ energy}}{m_{fabric}} = \frac{hr}{m_{output}} \times kW \times \frac{\$}{kWh}$$

Equation 2.29 - Steam Cost for Finishing in $ per Meter of Fabric

$$\frac{\$_{finish\ steam}}{m_{fabric}} = \frac{hr}{m_{output}} \times \frac{kg_{steam}}{hr} \times \frac{\$}{kg_{steam}}$$

Equation 2.30 - Finishing Cost for Knit Fabric in $ per Meter of Fabric

$$\frac{\$_{finishing}}{m_{fabric}} = \frac{\$_{finish\ labor}}{m_{fabric}} + \frac{\$_{finish\ energy}}{m_{fabric}} + \frac{\$_{finish\ steam}}{m_{fabric}}$$

2.4.1.1.3.2. Finishing Cost for Woven Fabric

The necessary resources for finishing the woven fabric including chemical and capital costs were provided by American Monforts LLC to determine the finishing cost for woven fabric. Fiallos (2009) assumed that the finishing output rate was 1800 meters per hour. Table 2.4 shows the resource consumption for this machine. Fiallos (2009) used Equations 2.27 through 2.29 to calculate the per meter cost of labor, energy and steam for finishing the woven fabric. Equation 2.31 is used to calculate the water cost for finishing the woven fabric. Equation 2.32 is a sum of all of the cost factors for finishing the woven fabric, including the chemical and capital costs.

Table 2.4: Resource Consumption for Woven Fabric Finishing

Component	Quantity	Units
Labor	1	operators/machine
Energy	30	kW
Steam	1400	kg_{steam}/hr
Water	7	$m^3{}_{water}/hr$
Chemicals	0.0365	$\$_{chemical}/lb_{yarn}$
Capital	0.0240	$\$_{dyes}/lb_{yarn}$

Equation 2.31 - Water Cost for Finishing Woven Fabric in $ per Meter of Fabric

$$\frac{\$_{finish\ water}}{m_{fabric}} = \frac{hr}{m_{output}} \times \frac{m^3{}_{water}}{hr} \times \frac{\$}{m^3{}_{water}}$$

Equation 2.32 - Finishing Cost for Woven Fabric Including Chemical and Capital Cost in $ per Meter of Fabric

$$\frac{\$_{finishing}}{m_{fabric}} = \frac{\$_{finish\ labor}}{m_{fabric}} + \frac{\$_{finish\ energy}}{m_{fabric}} + \frac{\$_{finish\ steam}}{m_{fabric}} + \frac{\$_{finish\ water}}{m_{fabric}} + \frac{\$_{finish\ chemicals}}{m_{fabric}} + \frac{\$_{finish\ capital}}{m_{fabric}}$$

2.4.1.2. Trim cost

In addition to fabric, some secondary materials, such as thread, labels, packing materials, zippers, and buttons, are required for garment manufacture. Fiallos (2009) mentioned that the prices for trims are very similar throughout all apparel producing companies with large production volumes. So, in Equation 2.33, Fiallos used the same trim costs for all countries for

T-shirts and the same trim costs for all countries for denim jeans. The costs of the trims for a T-shirt and a pair of denim jeans are shown in Table 2.5 and Table 2.6, respectively.

Equation 2.33 - Trim Cost

$$\frac{\$_{trim}}{garment} = \sum_{i\,=\,1}^{n} \left(\frac{\$}{trim_i} \times \frac{trim_i}{garment} \right)$$

Table 2.5: Trim Cost for a T-shirt in U.S. Dollars

Materials	Requirement		$/UOM	$/Garment
	UOM	Qty		
Thread	lb	0.0800	1.9200	0.1536
Tagless neck label	unit	1.0000	0.0180	0.0180
Poly bag	unit	1.0000	0.0160	0.0160
Swiftach	unit	1.0000	0.0011	0.0010
Hang tag	unit	1.0000	0.0320	0.0320
Size strip	unit	1.0000	0.0210	0.0210
Boxes	unit	1/60	0.8900	0.0148
Tape	ft	0.0800	0.0029	0.0002
TOTAL				0.2567

Table 2.6: Trim Cost for a Pair of Denim Jeans in U.S. Dollars

Materials	Requirement		$/UOM	$/Garment
	UOM	Qty		
Pocketing	unit	2.0000	0.1663	0.3326
Zipper	unit	1.0000	0.1550	0.1550
Thread	lb	0.1900	2.0550	0.3905
Fusionables	unit	1.0000	0.0077	0.0077
Patch Label	unit	1.0000	0.0490	0.0490
Woven Care Label	unit	1.0000	0.0666	0.0666
Country of Origin Label	unit	1.0000	0.0146	0.0146
Size Strip	unit	1.0000	0.0409	0.0409
VM Foldover	unit	1.0000	0.0200	0.0200
Hang tag	unit	2.0000	0.0320	0.0640
Swiftachs	unit	1.0000	0.0016	0.0016
Poly bag	unit	1.0000	0.0375	0.0375
Boxes	unit	1/24	0.8900	0.0371
Tape	ft	0.1900	0.0029	0.0006
Tack	unit	5.0000	0.0102	0.0510
Button	unit	1.0000	0.0285	0.0285
Rivets	unit	6.0000	0.0138	0.0828
TOTAL				1.3799

2.4.1.3. Labor Cost

The total labor cost in garment production includes direct labor costs and indirect labor costs as shown in Equation 2.34.

Equation 2.34 - Labor Cost

$$\frac{\$_{labor}}{garment} = \frac{\$_{direct\ labor}}{garment} + \frac{\$_{indirect\ labor}}{garment}$$

Direct labor refers to the labor involved in the actual sewing of the garment in terms of the standard allowed minutes (SAMs). Indirect labor includes the labor involved in preparing the pattern and cutting the fabric before sewing begins. In Fiallos (2009) study, 7 SAMs were used for T-shirt production and 21 SAMs for denim jeans. Operator efficiency rates and time on-standard (non-idle time) were set at 85% and 90%, respectively. Indirect to direct personnel ratios were set to a 1 to 5 ratio. In addition, indirect labor rates were assumed to be 80% of direct labor rates. Equation 2.35 and Equation 2.36 state the direct and indirect labor cost calculations in garment production.

Equation 2.35 - Apparel Conversion Direct Labor Cost

$$\frac{\$_{direct\ labor}}{garment} = \frac{\$_{labor}}{hr} \times \frac{1}{Efficiency} \times \frac{1}{Time_{on-standard}} X \frac{1hr}{60\ min} X \frac{SAMs}{garment}$$

Equation 2.36 - Apparel Conversion Indirect Labor Cost

$$\frac{\$_{indirect\ labor}}{garment} = \left(80\% \times \frac{\$_{\ labor}}{garment}\right) \times \frac{1}{Efficiency} \times \frac{1}{Time_{on-standard}}$$

$$\times \frac{1hr}{60\ min} X \frac{SAMs}{garment} \times Ratio_{indirect\ to\ direct}$$

2.4.1.4. Energy Cost

Equation 2.37 is used to calculate the energy cost in garment manufacturing. Fiallos (2009) calculated the energy consumption rates for the sewing equipment, lighting and estimated supporting power requirement by relating them to the SAMs necessary to cut, sew and finish a garment. The apparel energy consumption factors are shown in Table 2.7.

Equation 2.37 - Apparel Conversion Energy Cost

$$\frac{\$_{energy}}{garment} = \left(kW_{sewing\ machine} + kW_{support} + \left(\frac{kW_{lighting}}{m^2_{floorspace}} \times \frac{m^2_{floorspace}}{work\ station}\right)\right) \times \frac{\$}{kWh} \times \frac{SAMs}{garment} \times \frac{1}{60}$$

Table 2.7: Apparel Energy Consumption Factors

Component	Quantity	Units
Sewing Machine Energy	0.4	$kW_{sewing\ machine}$
Support Equipment Energy	0.3	$kW_{support}$
Lighting	0.185	$kW_{support}/m^2{}_{floorspace}$
Floorspace	2	$m^2{}_{floorspace}/work\ station$

2.4.1.5. Garment Finishing Cost

The cost of garment finishing was only applied to denim jeans. It is composed of the costs for dry processing and washing. Since the main costs in those processes are labor and water, only those costs were computed. The dry processing of basic denim jeans includes sanding, grinding, spraying of solutions on sanded areas, and other means of mechanical agitation, all of which are usually manual processes. Denim jeans also typically undergo garment washing. Fiallos (2009) consulted a denim laundry facility manager in Latin America for labor and water requirement data for these processes. He used Equation 2.38 and 2.39 to calculate the labor and water cost, respectively. Equation 2.40 is the total garment finishing cost. The garment finishing parameters are listed in Table 2.8.

Equation 2.38 - Labor Cost for Denim Jean Dry Processing

$$\frac{\$_{dry\ processing}}{garment} = \frac{\$_{labor}}{hr} \times \left(\frac{hr}{garment\ sanded} + \frac{hr}{garment\ sprayed} + \frac{hr}{garment\ ground}\right)$$

Equation 2.39 - Water Cost for Denim Jean Washing

$$\frac{\$_{washing}}{garment} = \frac{\$}{gln_{water}} \times \frac{gln_{water}}{load} \times \frac{load}{garments}$$

Equation 2.40 - Total Garment Finishing Cost

$$\frac{\$_{garment\ finishing}}{garment} = \frac{\$_{dry\ processing}}{garment} + \frac{\$_{washing}}{garment}$$

Table 2.8: Garment Finishing Parameters

Component	Quantity	Units
Sanding	25	garment sanded/hr
Spraying	25	garment sparayed/hr
Grinding	75	garment ground/hr
Water	2400	gln_{water}/load

2.4.1.6. Off-quality Cost

Quality issues also need to be considered in the manufacturing process. 2 percent and 3 percent of the sum of the cost of fabric, trim, apparel labor, apparel energy, and garment finishing costs were applied to the off-quality cost for T-shirts and denim jeans, respectively (Fiallos, 2009). Equation 2.41 shows the calculation of off-quality cost.

Equation 2.41 - Off-quality Cost

$$\frac{\$_{off-quality}}{garment} = \left(\frac{\$_{fabric}}{garment} + \frac{\$_{trim}}{garment} + \frac{\$_{labor}}{garment} + \frac{\$_{energy}}{garment} + \frac{\$_{garment\ finishing}}{garment}\right) \times factor_{off-quality}$$

2.4.1.7. Capital Cost

Fiallos (2009) pointed out that the capital cost was applied to fabric, trims, labor, and energy costs in apparel operations. The capital cost is the short-term financing expenses associated with apparel production. He used Equation 2.42 to calculate the capital cost by setting the capital rate at 3 percent. This amount was obtained from the CIT group.

Equation 2.42 - Capital Cost

$$\frac{\$_{capital}}{garment} = \left(\frac{\$_{fabric}}{garment} + \frac{\$_{trim}}{garment} + \frac{\$_{labor}}{garment} + \frac{\$_{energy}}{garment} + \frac{\$_{garment\ finishing}}{garment} + \frac{\$_{off-quality}}{garment}\right) \times capital_{rate}$$

2.4.2. Transportation Cost

Fiallos (2009) consulted maritime companies to obtain the insurance rate and container shipping costs. Fiallos (2009) found a forty-foot container can accommodate 38,000 T-shirts and 17,500 pairs of denim jeans. The insurance rate per container used was 1.87%. The capital rate used was 3 percent. Equation 2.43 shows the calculation of the garment transportation cost.

Equation 2.43 - Transportation Cost

$$\frac{\$_{garmen\ transportation}}{garment} = \left[\left(\frac{\$}{container} \times \frac{container}{garments}\right) + \left(Insurance\ Rate_{shipping} \times \frac{\$_{FOB}}{garment}\right)\right] \times (1 + capital_{rate})$$

2.4.3. Duty Cost

The general duty rate for T-shirts is 16.5%, while the general duty rate for denim jeans is 16.6% according to the HTS. The calculation for duty cost is shown in Equation 2.44. Countries that have a Free Trade Agreement (FTA) or Trade Preference Program (TPP) with the US generally have duty-free access to the US market, provided that the yarn forward rule of origin is met.

Equation 2.44 - Duty Cost

$$\frac{\$_{duty}}{garment} = \frac{\$_{FOB}}{garment} \times duty_{rate}$$

CHAPTER 3: RESEARCH METHODOLOGY

In order to explore the effect of paying living wages on various textile supply chains, this chapter explores two main parts. Section 3.1 selects two typical products (T-shirts and denim jeans) for sourcing cost calculation. And Section 3.2 modifies the general route of supply chain assumed by Faillos and discusses different supply chains analyzed by following chapter.

3.1. Sourcing Product Selection

Denim bottoms and knit tops are selected as sourcing products by Faillos (2009) based on trade data from OTEXA on major U.S. imports. These two product categories are sourced from all over the world including many Far East and Western Hemisphere countries. So this study will choose the same product as Faillos' for sourcing cost calculation.

In Faillos' (2009) research, the fabric for T-shirts and denim jeans was selected to be single jersey and print woven fabric, respectively, and the fabric information was obtained from the 2008 ITMF IPPC report. In the 2008 ITMF IPCC report, the fabric for T-shirt had a weight of 0.1198 kg/m^2 (0.23 kg/m with a width of 1.92 m), and the yarn used in making this fabric was 100% cotton Ne 30 ring spun combed yarn. However, for denim jeans, Fiallos (2009) assumed that 100% cotton Ne 6 rotor yarn would be used in denim production instead of 100% cotton Ne 20 rotor yarn which was reported in the ITMF IPCC 2014 since denim fabric is heavier and the yarn within it is coarser. The fabric woven by Ne 6 rotor yarn had a weight of 0.4238 kg/m^2 and a width of 1.68 m.

3.2. Supply Chain Selection

The supply chain Faillos (2009) used is depicted in Figure 3.1. Fiallos assumed that the yarn was manufactured in an ITMF country and then transported to a cut and sew country. In the cut and sew country, the fabric would be produced, dyed, and finished. After that, garment was cut and sewn. However, for the cut and sew countries that were not ITMF countries, it was difficult to calculate the cost of fabric production, dyeing, and finishing because of a lack of relevant data. Therefore, this data had to be estimated. For example, in Fiallos' model, the cost of fabric manufacturing, labor and energy were scaled to those of ITMF countries, and the auxiliary material, waste, and capital cost within fabric production were estimated to be the corresponding averages of the ITMF countries. Also, apparel wages were used instead of textile wages in the dyeing and finishing process.

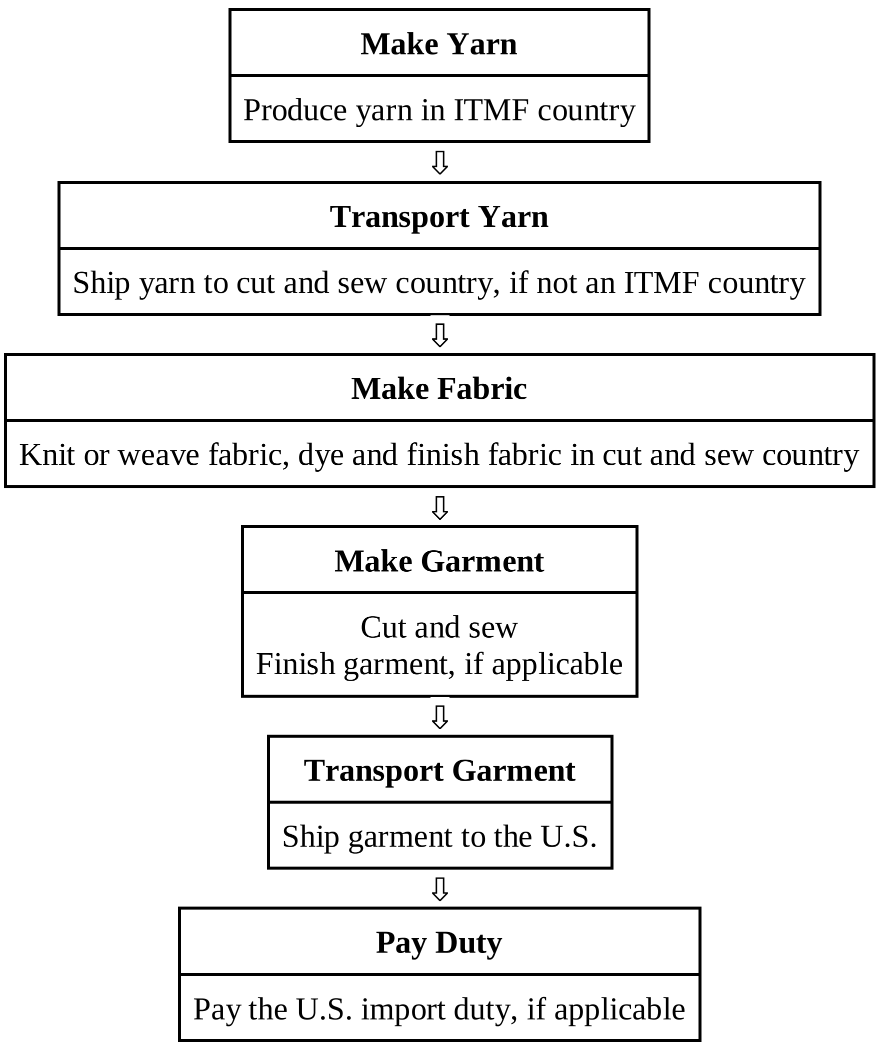

Figure 3.1. Fiallos' (2009) Apparel Supply Chain

So this study modifies Fiallos' (2009) general format of supply chain and it is shown in Figure 3.2. This study assumes the yarn manufacturing, fabric production (knitting and weaving), dyeing, and finishing all occur in the same ITMF country, because the ITMF report not only provides the cost of producing yarn but also provides the costs of knitting and weaving. In addition, the ITMF report is also a good source of cost inputs for dyeing and finishing. It is more accurate to calculate the costs of knitting, weaving, dyeing, and finishing by using the data from the report instead of the rough estimates in Fiallos' (2009) research. These modifications to the format of Fiallos' supply chain are the same ones made in Adikorely's (2016) research.

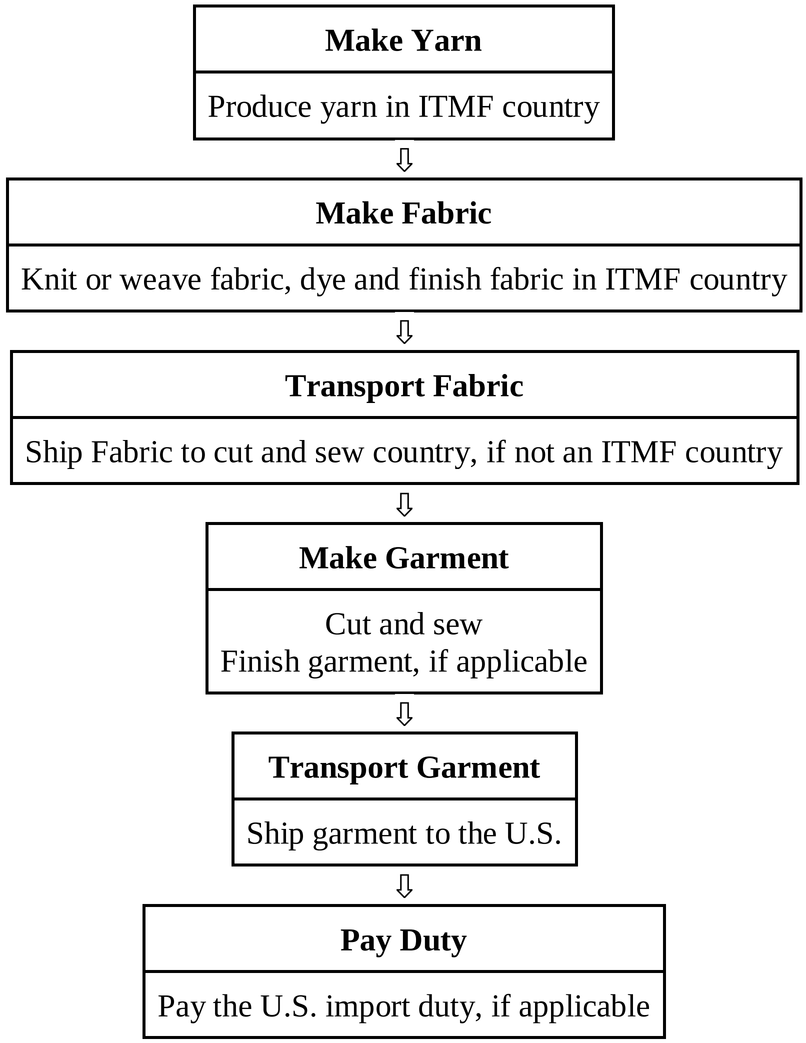

Figure 3.2. Apparel Supply Chain Studied in this Analysis

3.2.1. Cut and Sew Countries Analyzed

The U.S. imported apparel from as many as 150 countries in 2017 (Lu, 2018a). Most of sourcing destinations were developing countries, and most of them are located in Asia, including China (33.7 percent), Vietnam (14.4 percent), Bangladesh (6.3 percent), Indonesia (5.7 percent), India (4.6 percent) and Mexico (4.5 percent) (Lu, 2018a). Based on the data on apparel exports to the U.S. in 2017 published by the OTEXA (2018), it can be concluded that Asia is the dominant region from which the U.S. sources. Compared with other regions in global sourcing textiles and apparel, Asia has an advantage in some aspects: 1) proximity to cotton producing areas (the world's six major cotton producing countries, except the United States, Brazil, are India, China, Pakistan and Uzbekistan); 2) relatively low labor costs (Asian Countries, except Japan and South Korea, are generally developing countries); 3) strong government support (Ha-Brookshire, 2015).

Table 3.1 shows the top ten apparel exporters to the U.S. in 2017 in terms of total dollars of textile and apparel exports. From the table, more than half of the countries are located in Asia. For exploring the effect of paying living wages, Asia is an important region to be analyzed, and the top five countries in Asia are selected as cut and sew countries. These countries are China, Vietnam, India, Bangladesh and Indonesia, and they represent the 1st, 2nd, 3rd, 4th and 5th largest apparel exporters to the U.S. in dollars, respectively.

Table 3.1: Top Ten Textile and Apparel Exporting Countries to the U.S. in 2017 (OTEXA, 2018)

Country	Amount in Millions of U.S. ($)
China	38,708.800
Vietnam	12,180.001
India	7,398.324
Bangladesh	5,269.242
Indonesia	4,756.739
Mexico	4,716.774
Pakistan	2,759.073
Cambodia	2,230.679
Honduras	2,480.276
El Salvador	1,937.558

With the increase in labor costs in Asia, more and more companies are starting to focus on other countries besides China for sourcing, including countries in Sub-Saharan Africa (SSA). SSA has low labor wage, a sufficient labor force and numerous cotton producing areas. In addition, the establishment of the African Growth and Opportunity Act (AGOA) in 2000 enables 49 SSA Countries (40 SSA Countries currently are eligible in 2018) to export qualifying goods to the U.S. without import duties, it has been extended for another 10 years in 2015 (until September 30th, 2025) (AGOA, 2015a). This trade preference program enhances competitiveness of SSA countries in global sourcing. In the first four years after the establishment of AGOA (i.e. from 2000 to 2004), apparel imports from SSA into the U.S. increased, then began to decrease when the Multi-Fiber Agreement (MFA) quotas were completely phased out in 2005 (Adikorley, Thoney-Barletta, Joines and Rothenberg, 2017). U.S. apparel imports from SSA did not begin to increase again until 2012 (OTEXA, 2018).

The top five SSA countries in the terms of dollars of exports of textile and apparel to the U.S. in 2017 are Kenya, Lesotho, Madagascar, Ethiopia and Tanzania, and they represent the 30th, 31st, 36th, 45th and 57rd largest textiles and apparel exporters to the U.S. in dollars, respectively. Because of lack of information, except Lesotho, the remaining four are selected as the cut and sew countries. Ghana will also be included as a cut and sew country, because the U.S. West African trade hub headquarters is located in Ghana, and Ghana has a democratic political landscape and stable political environment. It also has a large number of graduates from textile and fashion related programs (Adikorley et al., 2017). Even though Ghana only ranks 77th largest textiles and apparel exporters to the U.S. in dollars, it may be advantageous for the U.S. to source more apparel from Ghana. Table 3.2 shows the countries selected from Asia and Sub-Saharan Africa.

Table 3.2: Selected Countries for Total Landed Cost Computation

Asia	Sub-Saharan Africa
China	Kenya
India	Madagascar
Vietnam	Ethiopia
Bangladesh	Tanzania
Indonesia	Ghana

Table 3.3 compares the selected countries in terms of population size, Gross Domestic Product (GDP), Gross National Income (GNI) per capita, literacy rate percent, and poverty level percent. All statistics are from 2016, unless otherwise noted, and the GDP and GNI are in U.S. dollars. The literacy rate is given in terms of the percent of the population over fifteen years of age. The poverty percent is the percent of the population living on less than $1.90 per day. As can be seen in Table 3.3, the population GDP and GNI per capita of these countries vary widely, and the poverty rates in Asian countries are generally much lower than in SSA countries. The majority of these countries selected have over 50 percent literacy rates.

Table 3.3: Profile of Selected Countries (World Bank, 2017)

Country	Population in Millions	GDP in Billions	GNI per Capita	Literacy Rate %	Poverty %
Asia					
China	1,386	12,237.70	8,690	95.124 (2010)	0.7
India	1,339.18	2,597.49	1,820	69.303 (2011)	10 (2015)
Vietnam	95.54	223.86	2,170	93.52 (2009)	2.0
Bangladesh	164.67	249.72	1,470	72.759 (2016)	14.8
Indonesia	263.99	1,015.54	3,540	95.377 (2016)	5.7
Sub-Saharan Africa					
Kenya	49.70	74.94	1,440	78.733 (2014)	36.8
Madagascar	25.57	11.50	400	71.573 (2012)	77.6 (2012)
Ethiopia	104.96	80.56	740	38.996	26.7
Tanzania	57.31	52.09	910	77.887 (2015)	49.1 (2011)
Ghana	28.83	47.33	1,490	71.497 (2010)	12 (2012)

3.2.2. Different Supply Chains Selection

The supply chains are determined under different conditions. To fulfill the assumption that the yarn and fabric (i.e., greige production, dyeing, and finishing) are produced within the ITMF country and to meet the yarn forward rule of origin, the initial supply chain for the cut and sew countries are decided as follows.

For those cut and sew countries that are in the ITMF IPCC report (i.e. China, India, Indonesia and Vietnam), supply chains are analyzed in which yarn, fabric, and garment production occur entirely within these countries. For Bangladesh, which is not included in the

ITMF IPCC report, India is selected as the place for it to obtain yarn and fabric because of proximity.

AGOA requires each country in SSA must be working to improve its rule of law, human rights, and respect for core labor standards to qualify and remain eligible for duty-free access to the U.S. In addition, to be eligible for apparel provisions, countries must have implemented a special apparel visa system. Favorable rules of origin (RoO) requirements have been implemented that allow all countries except South Africa to source yarn and fabric anywhere. For more details on AGOA eligibility requirements and more details on the "Apparel Rules of Origin", see the full text of AGOA Country Eligibility and AGOA Apparel Rules of Origin in AGOA, respectively (AGOA, 2015b; AGOA, 2015c). On January 1, 2015, Madagascar was reinstated and deemed eligible for AGOA. and for this analysis, it is assumed that each SSA country currently qualifies for AGOA and the apparel provisions within the agreement.

Under the conditions above, the yarn and fabric for most of the SSA countries is assumed to be made in Indonesia. Adikorley et al. (2016) found that SSA countries, except Ghana, were more cost competitive when producing T-shirts and denim jeans using Indonesia fabric. For Ghana, the U.S. is selected as the place for it to obtain yarn and fabric because of proximity.

Table 3.4 shows the different supply chains studied in this landed cost analysis.

Table 3.4: Initial Yarn and Fabric, Cut and Sew, and Garment Destination Countries

Yarn and Fabric Country	Cut and Sew Country	Garment Destination
China	China	U.S.
India	India	U.S.
Vietnam	Vietnam	U.S.
India	Bangladesh	U.S.
Indonesia	Indonesia	U.S.
Indonesia	Kenya	U.S.
Indonesia	Madagascar	U.S.
Indonesia	Ethiopia	U.S.
Indonesia	Tanzania	U.S.
U.S.	Ghana	U.S.

CHAPTER 4: LANDED COST ANALYSIS FOR T-SHIRTS AND DENIM JEANS

In order to explore the effect of paying living wages on various textile supply chains, a landed cost analysis of producing T-shirts and denim jeans using Fiallos' (2009) landed cost model is performed in this Chapter. The sourcing costs from Sub-Saharan African and Asian countries are computed by applying minimum wages and different living wages. Then, these costs are compared and analyzed to understand how paying living wage affects the performance of different global supply chains, as related to landed costs.

4.1. Applying Fiallos' (2009) Landed Cost Model by Paying the Lowest Living Wage

4.1.1. Exit FOB Cost

Fiallos (2009) used Equation 2.1, 2.2, 2.3, and 2.4 to calculate the landed cost, FOB value, and exit-factory cost, respectively. However, in this study, these equations were modified. In computing the FOB value in Equation 2.2 and 2.3, Fiallos (2009) took a tax rebate given by certain cut and sew countries (e.g. China) into consideration. But it does not make sense to incorporate cut and sew country rebates into this analysis, because taxes other than import duties to the U.S. were not included in this model. Moreover, in computing the capital cost in Equation 2.4, Fiallos (2009) increased materials and manufacturing cost by 3% for each garment. However, it is difficult to calculate the capital rate because it differs among companies. Therefore, the capital costs for short-term apparel sourcing were not included in this analysis. Therefore, instead of Equations 2.1, 2.2, 2.3, and 2.4, Equations 4.1 and 4.2 were used in this analysis.

Equation 4.1 - Landed Cost

$$\frac{\$}{garment} = \frac{\$_{exit-factory}}{garment} + \frac{\$_{garment\ transportation}}{garment} + \frac{\$_{duty}}{garment}$$

Equation 4.2 - Exit-Factory Cost

$$\frac{\$_{exit-factory}}{garment} = \frac{\$_{fabric}}{garment} + \frac{\$_{trim}}{garment} + \frac{\$_{apparel\ labor}}{garment} + \frac{\$_{apparel\ energy}}{garment} + \frac{\$_{garment\ finishing}}{garment} + \frac{\$_{off-quality}}{garment}$$

4.1.1.1. Total Fabric Cost

Equation 4.3 shows the calculation of the total fabric cost, which is a modification of Equation 2.5 by including fabric transportation cost. Equations 2.6 and 2.7 were used to compute the cost of the fabric for the T-shirt and denim jeans, respectively.

Equation 4.3 - Fabric Cost in $ per Meter Including Dyeing, Finishing, and Fabric Transportation

$$\frac{\$}{m_{fabric}} = \frac{\$_{greige}}{m_{fabric}} + \frac{\$_{dyeing}}{m_{fabric}} + \frac{\$_{finishing}}{m_{fabric}} + \frac{\$_{fabric\ transportation}}{m_{fabric}}$$

4.1.1.1.1. Greige Fabric Cost

The greige fabric costs for the T-shirts and denim jeans for China, Vietnam, India, Indonesia, and the U.S. were determined from the 2016 ITMF IPCC report. Table 4.1 shows the total cost of single jersey ring yarn in dollars per meter. Denim fabric was calculated using data from the 2016 ITMF IPCC report in the same manner in which Fiallos (2009) calculated the cost of denim. Table 4.2 shows the manufacturing costs given in the 2016 ITMF IPCC report for weaving rotor yarn into fabric with a width of 1.68m, which was in line with Equation 2.8, where capital equals to depreciation plus interest. Applying Equation 2.10 and 2.12, the yarn cost was computed by using the desired fabric width (1.68m) and weight (0.4238 kg/m2), taking the total cost of rotor yarn per kilogram from the 2016 ITMF IPCC report. This cost is displayed in Table 4.3. The total cost of the denim fabric per meter used in this analysis can be found in Table 4.4.

Table 4.1: Total Cost of Single Jersey Ring Yarn Fabric in $ per Meter (ITMF IPCC 2016 p.31)

County	Knit Fabric ($/m)
China	0.7700
Vietnam	0.5820
India	0.6240
Indonesia	0.6110
U.S.	0.7060

Table 4.2: Manufacturing Cost for Weaving Rotor Yarn in $ per Meter (ITMF IPCC 2016 p.20)

County	Waste	Labor	Power	Auxiliary Material	Depreciation	Interest	Total
China	0.008	0.045	0.075	0.043	0.054	0.018	0.2430
Vietnam	0.007	0.020	0.043	0.022	0.028	0.020	0.1400
India	0.006	0.010	0.056	0.053	0.047	0.030	0.2020
Indonesia	0.006	0.017	0.051	0.023	0.037	0.023	0.1560
U.S.	0.006	0.140	0.033	0.032	0.078	0.021	0.3100

Table 4.3: Total Cost of Rotor Yarn in $ per Kilogram (ITMF IPCC 2016 p.26)

County	Rotor Yarn ($/kg)
China	2.4050
Vietnam	1.8060
India	1.8300
Indonesia	1.8490
U.S.	1.8150

Table 4.4: Total Cost of Woven Greige Fabric using Ne 6 Rotor Yarn in $ per Meter (ITMF IPCC 2016 p.20)

County	Waste	Labor	Power	Auxiliary Material	Depreciation	Interest	Raw Material	Total
China	0.008	0.045	0.075	0.043	0.054	0.018	1.7123	1.9553
Vietnam	0.007	0.020	0.043	0.022	0.028	0.020	1.2858	1.4258
India	0.006	0.010	0.056	0.053	0.047	0.030	1.3029	1.5049
Indonesia	0.006	0.017	0.051	0.023	0.037	0.023	1.3165	1.4725
U.S.	0.006	0.140	0.033	0.032	0.078	0.021	1.2923	1.6023

4.1.1.1.2. Fabric Dyeing Cost

Tables 4.5 and 4.6 show the cost of labor, energy, steam and water for knitting and weaving in ITMF countries, respectively. This study used the wage for machine tenders in the 2016 ITMF IPCC report to estimate the dyeing and finishing wages. It should be noted that the steam cost and water cost of weaving were also used for knitting due to the lack of information about steam and water costs for knitting.

Table 4.5: Labor, Energy, Steam and Water Costs for Knitting in ITMF Countries (ITMF IPCC 2016 p.11,13)

Country	Knitting Wage in $/hr	Energy Cost in $/kWh	Steam in $/lb	Water in $/m3
China	2.7500	0.1200	0.0900	0.5400
Vietnam	1.2790	0.0690	0.0600	0.8800
India	0.7300	0.0890	0.1000	0.1600
Indonesia	1.3300	0.0810	0.0300	0.1100
U.S.	15.8000	0.0530	0.0100	0.8700

Table 4.6: Labor, Energy, Steam and Water Costs for Weaving in ITMF Countries (ITMF IPCC 2016 p.13)

Country	Weaving Wage in $/hr	Energy Cost in $/kWh	Steam in $/lb	Water in $/m3
China	3.2900	0.1200	0.0900	0.5400
Vietnam	1.3100	0.0700	0.0600	0.8800
India	0.7000	0.0900	0.1000	0.1600
Indonesia	1.2200	0.0800	0.0300	0.1100
U.S.	15.0000	0.0500	0.0100	0.8700

4.1.1.1.2.1. Dyeing Cost for Knit Fabric

Equation 2.13 through Equation 2.19 were used to calculate the dyeing cost for the knit fabric. Since the prices of raw materials have changed over time, updated costs of dyes and chemicals per pound of fabric, which was obtained from a dyestuff company by Adikorley (2016), were used in this study. They are $0.0543 and $2.3430, respectively. All of the other parameters (see Table 2.1) and the output rate in this study were kept the same as those used by

Fiallos (2009). Table 4.7 displays the knit fabric dyeing cost for the ITMF countries considered in this study.

Table 4.7: Dyeing Cost for Knit Fabric

Country	Labor ($/lb)	Energy ($/lb)	Steam ($/lb)	Water ($/lb)	Dyes & Chem. ($/lb)	Total	
						$/lb	$/m
China	0.0049	0.0102	0.1917	0.0098	2.3973	2.6139	1.3254
Vietnam	0.0023	0.0059	0.1278	0.0160	2.3973	2.5492	1.2926
India	0.0012	0.0076	0.2130	0.0029	2.3973	2.6220	1.3295
Indonesia	0.0024	0.0069	0.0639	0.0020	2.3973	2.4725	1.2537
U.S.	0.0280	0.0045	0.0213	0.0158	2.3973	2.4669	1.2509

4.1.1.1.2.2. Dyeing Cost for Woven Fabric

Equation 2.20 through Equation 2.26 were used to calculate the dyeing cost for the woven fabric. Updated estimated costs of dyes and chemicals per pound of fabric, which was obtained from a dyestuff company by Adikorley (2016), were used in this study. They are $0.1086 and $1.7778, respectively. All of the other resource consumptions for rope dyeing (see Table 2.2) and the output rate in this study were kept the same as those used by Fiallos (2009). Table 4.8 shows the woven fabric dyeing cost for the ITMF countries considered in this study.

Table 4.8: Dyeing Cost for Woven Fabric

Country	Labor ($/lb)	Energy ($/lb)	Steam ($/lb)	Water ($/lb)	Dyes & Chem. ($/lb)	Total	
						$/lb	$/m
China	0.0027	0.0019	0.071	0.0029	1.8864	1.9650	2.8653
Vietnam	0.0011	0.0011	0.0475	0.0047	1.8864	1.9407	2.8298
India	0.0006	0.0014	0.0791	0.0009	1.8864	1.9683	2.8701
Indonesia	0.0010	0.0012	0.0237	0.0006	1.8864	1.9130	2.7893
U.S.	0.0122	0.0008	0.00879	0.0047	1.8864	1.9119	2.7878

4.1.1.1.3. Fabric Finishing Cost

4.1.1.1.3.1. Finishing Cost for Knit Fabric

Equation 2.27 through Equation 2.30 were used to calculate the finishing cost for woven fabric. This analysis used the parameters of the Biancalani's Air 24 drying machine used by Adikorley (2016) instead of the Biancalani's Spyra 10 machine used by Fiallos (2009) to determine the finishing cost for knit fabric. The Air 24 machine has a highly-efficient and eco-friendly dryer for knits, wovens, and nonwoven fabric. This analysis used the average processing speed of this machine, which is 1590 meters per hour. In addition, the Air 24 consumes 90 kW/h of energy and 520 kg/h of steam, and requires 1 operator per machine. Table 4.9 shows the finishing cost for the knit fabric per meter.

Table 4.9: Finishing Cost for Knit Fabric in $ per Meter

Country	Labor ($/m)	Energy ($/m)	Steam ($/m)	Total ($/m)
China	0.0017	0.0068	0.0649	0.0734
Vietnam	0.0008	0.0039	0.0433	0.0480
India	0.0005	0.0050	0.0721	0.0776
Indonesia	0.0008	0.0046	0.0216	0.0270
U.S.	0.0099	0.0030	0.0072	0.0201

4.1.1.1.3.2. Finishing Cost for Woven Fabric

Equation 2.27 through Equation 2.30 were used to calculate the finishing cost for woven fabric. Equation 2.31 is used to calculate the water cost for washing the woven fabric. Equation 2.32 is used to calculate the total cost for finishing the woven fabric. The cost of chemicals was updated to $0.05, and capital cost was not included in Equation 2.32 because it was unclear how Fiallos (2009) determined it. All of the other resource consumption amounts for finishing (see Table 2.4) and the output rate in this study were kept the same as those used by Fiallos (2009). Table 4.10 shows the finishing cost for the woven fabric per meter.

Table 4.10: Finishing Cost for Woven Fabric in $ per Meter

Country	Labor ($/m)	Energy ($/m)	Steam ($/m)	Water ($/m)	Chemicals ($/m)	Total ($/m)
China	0.0018	0.0020	0.1543	0.0021	0.0500	0.1602
Vietnam	0.0007	0.0012	0.1029	0.0034	0.0500	0.1582
India	0.0004	0.0015	0.1715	0.0006	0.0500	0.2240
Indonesia	0.0007	0.0013	0.0514	0.0004	0.0500	0.1038
U.S.	0.0083	0.0008	0.0171	0.0034	0.0500	0.0796

4.1.1.1.4. Total Fabric Cost Excluding Transportation

Equation 2.5 was applied to determine the total fabric cost excluding transportation. The cost for the knit and denim fabric per meter is displayed in Table 4.11 and Table 4.12, respectively.

Table 4.11: Total Knit Fabric Cost Excluding Transportation in $ per Meter

Country	Greige	Dyeing	Finishing	Total
China	0.7700	1.3254	0.0294	2.1248
Vietnam	0.5820	1.2926	0.0480	1.9226
India	0.6240	1.3295	0.0776	2.0311
Indonesia	0.6110	1.2537	0.0271	1.8917
U.S.	0.7060	1.2509	0.0201	1.9770

Table 4.12: Total Woven Fabric Cost Excluding Transportation in $ per Meter

Country	Greige	Dyeing	Finishing	Total
China	1.9553	2.8653	0.1603	4.9808
India	1.5049	2.8701	0.2240	4.5990
Indonesia	1.4725	2.7893	0.1039	4.3657
Vietnam	1.4258	2.8298	0.1582	4.4139
U.S.	1.6023	2.7878	0.0797	4.4697

4.1.1.1.5. Fabric Transportation Cost

Equation 4.4 was used to compute the transportation cost per meter of fabric, which was adapted from Equation 2.11. Fiallos (2009) assumed that 16,646.84 kg of yarn could fit a forty-foot container, and the weight of the knit fabric and woven denim fabric is 0.23 kg/m and 0.712 kg/m, respectively. The transportation cost in this analysis was determined using the World

Freight Rate website (www.worldfreightrate.com). The freight cost with insurance was calculated by using the ports of origin and destination, type of goods, commodity value, container size, and mode of transportation. The cheapest ports were identified for the fabric producing country and the cut and sew country in each supply chain, where the fabric and cut and sew operations did not take place within the same country (see Table 4.13). Table 4.14 and Table 4.15 show the transportation costs of the knit and woven denim fabric, respectively.

Equation 4.4 - Fabric Transportation Cost in $ per Meter

$$\frac{\$_{fabric\ transportation}}{m_{fabric}} = \left(\frac{container}{kg_{yarn}} \times \frac{\$}{container} \times \frac{kg_{yarn}}{m_{fabric}}\right)$$

Table 4.13: Fabric Port of Origin and Cut and Sew Port of Destination

Yarn and Fabric Country to Cut & Sew Country	Port of Origin	Port of Destination
India to Bangladesh	Kolkata, India	Chittagong, Bangladesh
Indonesia to Kenya	Belawan, Indonesia	Mombasa, Kenya
Indonesia to Madagascar	Belawan, Indonesia	Toamasina, Madagascar
Indonesia to Ethiopia	Belawan, Indonesia	Berbera, Somalia
Indonesia to Tanzania	Belawan, Indonesia	Dar es Salaam, Tanzania
U.S. to Ghana	Miami, United States	Takoradi, Ghana

Table 4.14: Knit Fabric Transportation Cost Including Insurance

Yarn and Fabric Country	Cut and Sew Country	$/40ft Container Including Insurance	Fabric Transportation Cost $/m
India	Bangladesh	3,675.32-4,062.20	0.0508
Indonesia	Kenya	7,793.96-8,614.37	0.1077
Indonesia	Madagascar	7,702.07-8,512.82	0.1064
Indonesia	Ethiopia	8,620.91-9,528.38	0.1191
Indonesia	Tanzania	7,610.19-8,411.26	0.1051
U.S.	Ghana	11,053.24-12,216,73	0.1528

Table 4.15: Woven Fabric Transportation Cost Including Insurance

Yarn and Fabric Country	Cut and Sew Country	$/40ft Container Including Insurance	Fabric Transportation Cost $/m
India	Bangladesh	2,925.18-3,233.10	0.1251
Indonesia	Kenya	7,131.85-7,882.57	0.3050
Indonesia	Madagascar	7,039.96-7,781.01	0.3011
Indonesia	Ethiopia	7,958.80-8,796.57	0.3404
Indonesia	Tanzania	6,948.08-7,679.45	0.2972
U.S.	Ghana	10,320.04-12,406.37	0.4414

4.1.1.1.6. Fabric Cost per Garment Including Transportation Cost

Equation 4.3 was used to compute the total fabric cost per meter, which includes the costs of greige fabric, dyeing, finishing and transportation. The results for both knit and woven denim fabric are displayed in Table 4.16 and Table 4.17, respectively. The total fabric costs per garment were calculated using Equations 2.6 and 2.7, and the relevant parameters were discussed in section 2.5.1.1. The total fabric cost per T shirt and per pair of denim jeans are shown in Table 4.18 and Table 4.19, respectively.

Table 4.16: Total Knit Fabric Cost Including Fabric Transportation Costs in $ per Meter

Yarn and Fabric Country	Cut and Sew Country	Fabric Cost Without Transportation	Fabric Transportation Cost	Total
China	China	2.1248	0.0000	2.1248
Vietnam	Vietnam	1.9226	0.0000	1.9226
India	India	2.0311	0.0000	2.0311
India	Bangladesh	2.0311	0.0508	2.0819
Indonesia	Indonesia	1.8917	0.0000	1.8917
Indonesia	Kenya	1.8917	0.1077	1.9994
Indonesia	Madagascar	1.8917	0.1064	1.9982
Indonesia	Ethiopia	1.8917	0.1191	2.0108
Indonesia	Tanzania	1.8917	0.1051	1.9969
U.S.	Ghana	1.9770	0.1528	2.1298

Table 4.17: Total Woven Denim Fabric Cost Including Fabric Transportation Costs in $ per Meter

Yarn and Fabric Country	Cut and Sew Country	Fabric Cost Without Transportation	Fabric Transportation Cost	Total
China	China	4.9808	0.0000	4.9808
Vietnam	Vietnam	4.4139	0.0000	4.4139
India	India	4.5990	0.0000	4.5990
India	Bangladesh	4.5990	0.1251	4.7241
Indonesia	Indonesia	4.3657	0.0000	4.3657
Indonesia	Kenya	4.3657	0.3050	4.6707
Indonesia	Madagascar	4.3657	0.3011	4.6668
Indonesia	Ethiopia	4.3657	0.3404	4.7061
Indonesia	Tanzania	4.3657	0.2972	4.6629
U.S.	Ghana	4.4697	0.4414	4.9111

Table 4.18: Fabric Cost in U.S. Dollars per T-shirt

Country	Fabric Cost ($)
China	1.2350
Vietnam	1.1175
India	1.1805
Bangladesh	1.2101
Indonesia	1.0995
Kenya	1.1621
Madagascar	1.1614
Ethiopia	1.1688
Tanzania	1.1606
Ghana	1.2379

Table 4.19: Fabric Cost in U.S. Dollars per Pair of Denim Jeans

Country	Fabric Cost ($)
China	7.9278
Vietnam	7.0254
India	7.3201
Bangladesh	7.5192
Indonesia	6.9487
Kenya	7.4342
Madagascar	7.4279
Ethiopia	7.4905
Tanzania	7.4217
Ghana	7.8169

4.1.1.2. Trim Cost

The cost of trims is very similar in all large volume apparel production facilities. Trim costs in this study and were kept the same as those used by Fiallos (2009). The trim costs for T-shirts and denim jeans are shown in Table 2.5 and 2.6, respectively.

4.1.1.3. Labor Cost

General information on labor wages for the textile and apparel industry all over the world is scarce and fragmented and difficult to compute because of different standards, and calculation methods. In this study, living wages are based on the resources published by the Global Living Wage Coalition (2018a), the Asia Floor Wage Alliance (2018a), and the WageIndicator.org (2018a). Table 4.20 shows the monthly wages in dollars reported from these three sources for the countries selected for this study. Ranges represent the lowest and the highest living wages applicable to textile and apparel workers.

Table 4.20: Monthly Labor Living Wages in U.S. Dollars for 2016

Country	Global Living Wage Coalition Wage	Asia Floor Wage	WageIndicator.org Wage	Lowest Living Wage
China	412-646	574	-	412
Vietnam	172-277	274	221-333	172
India	133-224	169	162-235	133
Bangladesh	177-214	114	126-167	114
Indonesia	-	178	146-189	146
Kenya	138-219	-	297-402	138
Madagascar	-	-	121-171	121
Ethiopia	148	-	197-230	148
Tanzania	-	-	189-258	189
Ghana	207	-	198-286	198

Note: A single value represents a national living wage. While a range represents the minimum and maximum living wages across provinces/regions.

There are some differences in reported wages across the three sources. First, these living wages are either national, regional or by province. Some countries have living wages specific to garment workers, while others have only general living wages. Secondly, these wages are either for unskilled, semi-skilled or skilled garment workers' living wages. In addition, the different types of family and calculation methods also contribute these differences. Third, the differences in reported wages across the three sources could also be due to the time these wages were obtained by the sources and the exchange rates used because living wages and exchange rate change over time.

The Global Living Wage Coalition brings together Fairtrade International, GoodWeave International, the Rainforest Alliance, and Social Accountability International (SAI), in partnership with the ISEAL Alliance and international living wage experts Dr. Richard Anker and Ms. Martha Anker. It aims to continuously improve the workers' wages in the farms, factories, and supply chains participating in their respective certification systems and beyond, and promote to pay workers a living wage for the long term (Global Living Wage Coalition, 2018b). The Anker Methodology used by GLWC is a widely accepted and published new methodology to estimate living wages that is both internationally comparable and locally specific. It combines available secondary data and new local data to calculate the living wages of different regions or countries. Food costs, housing costs and other essential needs (including health care, education, clothing, and transportation) all included in living wage provided by GLWC (Global Living Wage Coalition, 2018c).

Asia Floor Wage Alliance started in 2005 when trade unions and labor rights activists from across Asia came together to agree a strategy for improving the lives of garment workers. The living wage computed by the Asia Floor Wage can be applied across all countries in Asia. It aims to allow garment workers to live better in their respective countries and prevent brands from moving elsewhere for lower wages (Asia Floor Wage Alliance, 2018b). Food and Non-food costs including housing, clothing, healthcare (including maternity and child care), education, fuel, transport and savings are included in its living wage calculation. For the Asia Floor Wage, it is assumed that food costs account for 50% of expenditure (Asia Floor Wage Alliance, 2018c).

WageIndicator Foundation consists of WageIndicator websites; WageIndicator Salary and workings conditions; Minimum Wages Database; Collective Agreement Database; Salary Checks and Calculations; Decent Work Checks and related Data base. It aims to provide worldwide comparable Living Wages in all countries where WageIndicator operates (WageIndicator.org, 2018b). The WageIndicator estimation of the Living Wage is consistent with the methodology developed by Richard and Martha Anker for the Global Living Wage Coalition. The difference is that WageIndicator.org uses prices collected through web surveys across the world, as well as face-to-face surveys and observing prices in shops and markets in order to provide timely, reasonably accurate and globally comparable estimates. The living wages are updated every quarter to reflect changes in prices of food, housing and transportation (WageIndicator.org, 2018b).

Table 4.21 shows the differences in living wage calculation of three sources.

Table 4.21: Comparison Among Three Sources about the Living Wage Calculation

<table>
<tr><th rowspan="2">Source</th><th rowspan="2">Methodology</th><th rowspan="2">Data Level</th><th rowspan="2">Type of Family</th><th colspan="2">Components of the Living Wage</th></tr>
<tr><th>Category</th><th>Yes</th></tr>
<tr><td rowspan="8">Global Living Wage Coalition Wage</td><td rowspan="8">Anker Methodology</td><td rowspan="8">Secondary data and new local data</td><td rowspan="8">(Typical family in a specific area)
Worker: More than the typical number of full-time equivalent workers per family for that location</td><td>Food</td><td>√</td></tr>
<tr><td>Housing</td><td>√</td></tr>
<tr><td>Transportation</td><td>√</td></tr>
<tr><td>Education</td><td>√</td></tr>
<tr><td>Health Care</td><td>√</td></tr>
<tr><td>Clothing</td><td>√</td></tr>
<tr><td>Fuel</td><td></td></tr>
<tr><td>Saving</td><td></td></tr>
<tr><td rowspan="8">Asia Floor Wage</td><td rowspan="8">-</td><td rowspan="8">Secondary data</td><td rowspan="8">(Standard family)
Adults: 2
Children:2
Worker: 2</td><td>Food</td><td>√</td></tr>
<tr><td>Housing</td><td>√</td></tr>
<tr><td>Transportation</td><td>√</td></tr>
<tr><td>Education</td><td>√</td></tr>
<tr><td>Health Care</td><td>√</td></tr>
<tr><td>Clothing</td><td>√</td></tr>
<tr><td>Fuel</td><td>√</td></tr>
<tr><td>Saving</td><td>√</td></tr>
<tr><td rowspan="8">WageIndicator.org Wage</td><td rowspan="8">Anker Methodology</td><td rowspan="8">Primary Data</td><td rowspan="8">(Standard family)
Adults: 2
Children: 2
Worker: 2 (Both adults work full-time)
1.8 or 1.5 (At least one adult works part-time or half-time)
1 (One adult does not work)</td><td>Food</td><td>√</td></tr>
<tr><td>Housing</td><td>√</td></tr>
<tr><td>Transportation</td><td>√</td></tr>
<tr><td>Education</td><td>√</td></tr>
<tr><td>Health Care</td><td>√</td></tr>
<tr><td>Clothing</td><td>√</td></tr>
<tr><td>Fuel</td><td></td></tr>
<tr><td>Saving</td><td></td></tr>
</table>

According to the Hours of Work (Industry) Convention of 1919, the maximum working hours should be 8 hours per day and 48 hours per week (ILO, n.d). In addition, the ILO (2014) claimed that 48 work hours per week is typical for most middle-income countries, and sometimes more in the clothing industry. For developed countries, 40 work hours per week is typically the norm. Table 4.22 shows the accepted number of working hours per week by the selected countries (Wageindicator.org, 2018).

Using the formula $Hourly\ rate = \frac{monthly\ wage \times 12}{hours_{week} \times 52}$, the wages in Table 4.20 were converted to hourly rates. Monthly wage is the monthly wage reported by the country, 12 is the number of months in a year, 52 is the number of weeks in a year and $hours_{week}$ is the country approved working hours per week. Table 4.23 shows the lowest hourly living wage converted for each country.

Table 4.22: Working Hours in Country Selected

Country	Working Hours/Week by Country
China	40-44
Vietnam	45-48
India	45-48
Bangladesh	48
Indonesia	40-44
Kenya	>48
Madagascar	40-44
Ethiopia	<39
Tanzania	45-48
Ghana	40-44

Table 4.23: Lowest Hourly Labor Living Wages in U.S. Dollars for 2016

Country	Lowest Hourly Living Wage
China	2.1608
Vietnam	0.8269
India	0.6394
Bangladesh	0.5481
Indonesia	0.7657
Kenya	0.6635
Madagascar	0.6346
Ethiopia	0.8757
Tanzania	0.9087
Ghana	1.0385

Table 4.24 and Table 4.25 show the results of using Equation 2.34 through Equation 2.36 and applying the lowest living wages from Table 4.23 to calculate the labor costs for both T-shirts and denim jeans production.

Table 4.24: Labor Cost in U.S. Dollars per T-shirt by Paying the Lowest Living wages

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.3295	0.0527	0.3823
Vietnam	0.1261	0.0202	0.1463
India	0.0975	0.0156	0.1131
Bangladesh	0.0836	0.0134	0.0970
Indonesia	0.1168	0.0187	0.1355
Kenya	0.1012	0.0162	0.1174
Madagascar	0.0968	0.0155	0.1123
Ethiopia	0.1336	0.0214	0.1549
Tanzania	0.1386	0.0222	0.1607
Ghana	0.1584	0.0253	0.1837

Table 4.25: Labor Cost in U.S. Dollars per Pair of Denim Jeans by Paying the Lowest Living Wages

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.9886	0.1582	1.1468
Vietnam	0.3783	0.0605	0.4389
India	0.2925	0.0468	0.3394
Bangladesh	0.2508	0.0401	0.2909
Indonesia	0.3503	0.0561	0.4064
Kenya	0.3035	0.0486	0.3521
Madagascar	0.2903	0.0465	0.3368
Ethiopia	0.4007	0.0641	0.4648
Tanzania	0.4157	0.0665	0.4822
Ghana	0.4751	0.0760	0.5511

4.1.1.4. Energy Cost

Information on energy for the textile and apparel industry all over the world is scarcer than labor wages. For the ITMF countries, the energy prices reported in the 2016 ITMF report were used (ITMF, 2016). For other countries, the energy data was collected from Climatescope (2016). The energy rates stated in the ITMF report were not overall country averages for China and the U.S. For China, it was the average of three provinces (Jiangsu, Zhejiang and Fujian), and for the U.S., it was the average rate for industrial users in South Carolina. The rates reported from Climatescope are the average industrial electricity prices in U.S. dollars.

Climatescope is an interactive report and index. It evaluates the energy climate and publishes average commercial, industrial, and retail prices for fifty-four countries now. This index was established in 2012 and developed by the Multilateral Investment Fund of the Inter-

American Development Bank Group in partnership with Bloomberg New Energy Finance. From 2014 to 2016, the UK Department for International Development and the US Agency for International Development, as supporters and advisors, joined the index (about the Climatescope, n.d).

Table 4.26 and 4.27 show the energy cost per kWh in the countries selected in U.S. dollars for knitting and weaving, respectively.

Table 4.26: 2016 Energy Rates in Countries Selected for Knitting

Country	$/kWh	Sources
China	0.1200	ITMF IPCC 2016
Vietnam	0.0690	ITMF IPCC 2016
India	0.0890	ITMF IPCC 2016
Bangladesh	0.0980	Climatescope 2016
Indonesia	0.0810	ITMF IPCC 2016
Kenya	0.1340	Climatescope 2016
Madagascar	0.1949	Climatescope 2018
Ethiopia	0.0440	Climatescope 2016
Tanzania	0.1113	Climatescope 2016
Ghana	0.1892	Climatescope 2016

Table 4.27: 2016 Energy Rates in Countries Selected for Weaving

Country	$/kWh	Sources
China	0.1200	ITMF IPCC 2016
Vietnam	0.0700	ITMF IPCC 2016
India	0.0900	ITMF IPCC 2016
Bangladesh	0.0980	Climatescope 2016
Indonesia	0.0800	ITMF IPCC 2016
Kenya	0.1340	Climatescope 2016
Madagascar	0.1949	Climatescope 2018
Ethiopia	0.0440	Climatescope 2016
Tanzania	0.1113	Climatescope 2016
Ghana	0.1892	Climatescope 2016

Equation 2.37 was used to compute the energy cost for both T-shirts and denim jeans. The apparel energy consumption factors (see Table 2.7) and in the SAMs for completing the garments in this study were kept the same as those used by Fiallos (2009). The energy costs for T-shirts and denim jeans are shown in Table 4.28 and Table 4.29, repsectively

Table 4.28: Apparel Energy Cost per T-shirt in U.S. Dollars

Country	Energy Cost ($)
China	0.0150
Vietnam	0.0086
India	0.0111
Bangladesh	0.0122
Indonesia	0.0101
Kenya	0.0167
Madagascar	0.0243
Ethiopia	0.0055
Tanzania	0.0139
Ghana	0.0236

Table 4.29: Apparel Energy Cost per Pair of Denim Jeans in U.S. Dollars

Country	Energy Cost ($)
China	0.0449
Vietnam	0.0262
India	0.0337
Bangladesh	0.0367
Indonesia	0.0300
Kenya	0.0502
Madagascar (46)	0.0730
Ethiopia	0.0165
Tanzania	0.0417
Ghana	0.0709

4.1.1.5. Garment Finishing Cost

Garment finishing was only applied to denim jeans. Equation 2.38 and Equation 2.39 were used to compute the cost of labor and water for finishing denim jeans in U.S. dollars by applying living wages. Equation 2.40 sums the total garment finishing cost. The garment finishing parameters in Table 2.8 were used for this calculation.

Water prices were collected from published water tariffs from the individual countries and the 2016 ITMF report in cubic meters. Table 4.30 shows the water prices in U.S. dollar rates in both cubic meters and gallons. Table 4.31 shows the total cost of finishing the denim jeans.

Table 4.30: Water Prices per Cubic Meter in U.S. Dollars

Country	U.S. $/m3	$/ gallon	Source
China	0.5400	0.0020	ITMF IPCC 2016
Vietnam	0.8800	0.0033	ITMF IPCC 2016
India	0.1600	0.0006	ITMF IPCC 2016
Bangladesh	0.4019	0.0015	Dhaka Water Supply and Sewerage Authority
Indonesia	0.1100	0.0004	ITMF IPCC 2016
Kenya	0.3944	0.0015	Water Service Regulatory Board
Madagascar	0.3664	0.0014	Jirama
Ethiopia	0.2065	0.0008	Ministry of Water and Energy of Ethiopia
Tanzania	0.4772	0.0018	Tanzania Investment Centre
Ghana	2.4864	0.0094	Ghana Water Company Limited

Table 4.31: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying the Lowest Living Wages

Country	Labor Cost ($)	Water Cost ($)	Total Cost ($)
China	0.2017	0.0409	0.2426
Vietnam	0.0772	0.0666	0.1438
India	0.0597	0.0121	0.0718
Bangladesh	0.0512	0.0304	0.0816
Indonesia	0.0715	0.0083	0.0798
Kenya	0.0619	0.0299	0.0918
Madagascar	0.0592	0.0277	0.0870
Ethiopia	0.0817	0.0156	0.0974
Tanzania	0.0848	0.0361	0.1209
Ghana	0.0969	0.1882	0.2852

4.1.1.6. Off-Quality Cost

Equation 2.41 was used to calculate the off-quality cost for T-shirts and denim jeans. Fiallos (2009) set off-quality to two percent of the total cost of fabric, trim, apparel labor, and energy for T-shirts, while three percent for the same garment production costs plus garment finishing for denim jeans. The results are shown in Table 4.32 and Table 4.33.

Table 4.32: Off-Quality Cost per T-shirt in U.S. Dollars by Paying the Lowest Living Wages

Country	Off-Quality Cost ($)
China	0.0378
Vietnam	0.0306
India	0.0312
Bangladesh	0.0315
Indonesia	0.0300
Kenya	0.0311
Madagascar	0.0311
Ethiopia	0.0317
Tanzania	0.0318
Ghana	0.0340

Table 4.33: Off-Quality Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Lowest Living Wages

Country	Off-Quality Cost ($)
China	0.3223
Vietnam	0.2704
India	0.2743
Bangladesh	0.2792
Indonesia	0.2653
Kenya	0.2792
Madagascar	0.2791
Ethiopia	0.2835
Tanzania	0.2834
Ghana	0.3031

4.1.2. Exit-Factory Cost

Equation 2.4 was used to calculate the exit-factory cost which is the sum of the fabric, trims, apparel labor, apparel energy, garment finishing, and off-quality costs. For T-shirts, there was no garment finishing cost. Table 4.34 and Table 4.35 show the exit-factory cost for T-shirts and denim jeans, respectively.

Table 4.34: Exit-factory Cost per T-shirt in U.S. Dollars by Paying the Lowest Living Wages

Country	Exit Factory Cost ($)
China	1.9267
Vietnam	1.5596
India	1.5927
Bangladesh	1.6075
Indonesia	1.5318
Kenya	1.5840
Madagascar	1.5858
Ethiopia	1.6176
Tanzania	1.6238
Ghana	1.7360

Table 4.35: Exit-factory Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Lowest Living Wages

Country	Exit Factory Cost ($)
China	11.0643
Vietnam	9.4192
India	9.2846
Bangladesh	9.5875
Indonesia	9.1101
Kenya	9.5874
Madagascar	9.5837
Ethiopia	9.7325
Tanzania	9.7298
Ghana	10.4070

4.1.3. Garment Transportation Cost

The garment transportation cost to the U.S. was calculated using the World Freight Rate website (www.worldfreightrate.com). A forty-foot container can fit 38,000 T-shirts or 17,500 pairs of denim jeans, and the shipping costs obtained from the World Freight Rate already include insurance. In addition, capital cost was excluded in this study because capital rate differs from company to company. So Equation 4.5 was used to calculate the garment transportation cost for T-shirts and denim jeans, which was adapted from Equation 2.43. The cheapest ports were identified for the cut and sew country and the U.S. in each supply chain (see Table 4.36). The freight costs for each country per forty-foot container for T-shirts and denim jeans are shown in Table 4.37 and Table 4.38, respectively.

Equation 4.5 - Transportation Cost per Garment

$$\frac{\$_{garment\ transportation}}{garment} = \frac{\$}{container} \times \frac{container}{garment}$$

Table 4.36: Cut and Sew Port of Origin and Garment Port of Destination

Cut & Sew Country to the U.S.	Port of Origin	Port of destination
China to the U.S.	Qingdao, China	Long Beach, United States
Vietnam to the U.S.	Da Nang, Vietnam	Long Beach, United States
India to the U.S.	Kolkata, India	Long Beach, United States
Bangladesh to the U.S.	Chittagong, Bangladesh	Long Beach, United States
Indonesia to the U.S.	Belawan, Indonesia	Long Beach, United States
Kenya to the U.S.	Mombasa, Kenya	Long Beach, United States
Madagascar to the U.S.	Toamasina, Madagascar	Long Beach, United States
Ethiopia to the U.S.	Berbera, Somalia	Long Beach, United States
Tanzania to the U.S.	Dar es Salaam, Tanzania	Long Beach, United States
Ghana to the U.S.	Takoradi, Ghana	Miami, United States

Table 4.37: T-shirt Transportation Costs to the U.S. Including Insurance by Paying the Lowest Living Wages

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/T-shirt ($)
China	4,022.36-4,445.77	0.1059
Vietnam	4,118.81-4,552.37	0.1084
India	4,089.32-4,519.78	0.1076
Bangladesh	4,347.77-4,805.43	0.1144
Indonesia	4,746.87-5,246.55	0.1249
Kenya	9,688.06-10,707.85	0.2549
Madagascar	9,540.29-10,544.53	0.2511
Ethiopia	11,057.42-12,221.36	0.2910
Tanzania	9,421.33-10,413.05	0.2479
Ghana	8,343.43-9,221.68	0.2196

Table 4.38: Denim Jeans Transportation Cost to the U.S. Including Insurance by Paying the Lowest Living Wages

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/Jeans ($)
China	5,848.71-6,464.36	0.3342
Vietnam	5,967.29-6,595.43	0.3410
India	5,956.30-6,583.28	0.3404
Bangladesh	6,258.97-6,917.81	0.3577
Indonesia	6,559.38-7,249.84	0.3748
Kenya	11,617.89-12,840.82	0.6639
Madagascar	11,467.46-12,674.57	0.6553
Ethiopia	13,008.78-14,378.13	0.7434
Tanzania	11,366.86-12,563.37	0.6495
Ghana	10,425.05-11,522.43	0.5957

4.1.4. Duty Cost

The HTS codes for both T-shirts and denim jeans for men and women are listed below.

- 6109100012: Men’s cotton T-shirts, knitted or crocheted, except underwear
- 6109100040: Women’s cotton T-shirts, knitted or crocheted, except underwear
- 6203424011: Men’s blue denim trousers & breeches cotton not knit
- 6204624011: Women’s blue denim trousers & breeches cotton not knit

According to the Harmonized Tariff Schedule (HTS) code, the general import duty percent for T-shirts and denim jeans are 16.5% of the FOB value and 16.6% of the FOB value, respectively. However, some countries qualify for duty-free access under a specific trade agreement (such as AGOA), and thus these countries will not pay duty charges. Table 4.39 and

Table 4.40 show the duty percent for each country. Table 4.41 and Table 4.42 show the duty charges in dollars per T-shirt and per pair of denim jeans, respectively.

Table 4.39: Duty Percent for T-shirts

Country	Duty %	Reason
China	16.5	No trade agreement
Vietnam	16.5	No trade agreement
India	16.5	No trade agreement
Bangladesh	16.5	No trade agreement
Indonesia	16.5	No trade agreement
Kenya	0	Qualifies under AGOA
Madagascar	0	Qualifies under AGOA
Ethiopia	0	Qualifies under AGOA
Tanzania	0	Qualifies under AGOA
Ghana	0	Qualifies under AGOA

Table 4.40: Duty Percent for Denim Jeans

Country	Duty %	Reason
China	16.6	No trade agreement
Vietnam	16.6	No trade agreement
India	16.6	No trade agreement
Bangladesh	16.6	No trade agreement
Indonesia	16.6	No trade agreement
Kenya	0	Qualifies under AGOA
Madagascar	0	Qualifies under AGOA
Ethiopia	0	Qualifies under AGOA
Tanzania	0	Qualifies under AGOA

Table 4.41: Duty per T-shirt in U.S. Dollars by Paying the Lowest Living Wages

Country	Duty ($)
China	0.3179
Vietnam	0.2573
India	0.2628
Bangladesh	0.2652
Indonesia	0.2528
Kenya	0.0000
Madagascar	0.0000
Ethiopia	0.0000
Tanzania	0.0000
Ghana	0.0000

Table 4.42: Duty per Pair of Denim Jeans in U.S. Dollars by Paying the Lowest Living Wages

Country	Duty ($)
China	1.8367
Vietnam	1.5412
India	1.5636
Bangladesh	1.5915
Indonesia	1.5123
Kenya	0.0000
Madagascar	0.0000
Ethiopia	0.0000
Tanzania	0.0000
Ghana	0.0000

4.1.5. Landed Cost

Equation 2.1 was used to calculate the landed cost per garment, and the cost for T- shirts and denim jeans are displayed in Table 4.43 and Table 4.44, respectively.

Table 4.43: Landed Cost per T-shirt in U.S. Dollars by Paying the Lowest Living Wages

Country	Landed Cost ($)
China	2.3505
Vietnam	1.9254
India	1.9631
Bangladesh	1.9871
Indonesia	1.9095
Kenya	1.8389
Madagascar	1.8368
Ethiopia	1.9086
Tanzania	1.8717
Ghana	1.9555

Table 4.44: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Lowest Living Wages

Country	Landed Cost ($)
China	13.2352
Vietnam	11.1668
India	11.3231
Bangladesh	11.5367
Indonesia	10.9972
Kenya	10.2513
Madagascar	10.239
Ethiopia	10.4758
Tanzania	10.3794
Ghana	11.0028

4.2. Applying Fiallos' (2009) Landed Cost Model by Paying the Minimum Wage

4.2.1. Exit FOB Cost

4.2.1.1. Total Fabric Cost, Trim Cost, Energy Cost, Garment Finishing Cost

The total costs of fabric, trims, and energy for T-shirts and denim jeans when paying minimum labor wages are the same as when paying the lowest living labor wages.

4.2.1.2. Labor Cost

The monthly minimum wages (see Table 4.45) were obtained from Emerging Textiles, Fair Labor Association and WageIndicator.org, and converted into U.S. dollars using the average 2016 exchange rate (see Table 4.46). Table 4.47 shows the lowest hourly apparel minimum labor wages in U.S. dollars for 2016 by using the hourly rate formula mentioned in Section 4.1.1.3.

Table 4.45: Monthly Labor Minimum Wages in U.S. Dollars for 2016

Country	Emerging Textiles	Fair Labor Association Wage	WageIndicator.org Wage	Lowest Minimum Wage
China	310	173-310	153-370	153
Vietnam	145	-	146-209	145
India	150	58-110	-	58
Bangladesh	96	70-142	102	71
Indonesia	168	118-210	109-276	109
Kenya	-	-	67	67
Madagascar	61.4	-	47-101	47
Ethiopia	-	-	19-54	19
Tanzania	-	-	115,000	52
Ghana	-	-	67	67

Table 4.46: Exchange Rate in U.S. Dollars for 2016

Country	Exchange Rate ($)
China	0.15291
Vietnam	0.00005
India	0.01481
Bangladesh	0.01271
Indonesia	0.00007
Kenya	0.00986
Madagascar	0.00032
Ethiopia	0.04589
Tanzania	0.00046
Ghana	0.24691

Table 4.47: Lowest Hourly Labor Minimum Wages in U.S. Dollars for 2016

Country	Lowest Hourly Living Wage
China	0.8024
Vietnam	0.6971
India	0.2788
Bangladesh	0.3365
Indonesia	0.5717
Kenya	0.3221
Madagascar	0.2465
Ethiopia	0.1124
Tanzania	0.2500
Ghana	0.3514

The labor costs for both T-shirts and denim jeans production were calculated by applying the lowest minimum wages from Table 4.47. Table 4.48 and Table 4.49 show the results.

Table 4.48: Labor Cost in U.S. Dollars per T-shirt by Paying the Minimum wages

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.1224	0.0196	0.1420
Vietnam	0.1063	0.0170	0.1233
India	0.0425	0.0068	0.0493
Bangladesh	0.0513	0.0082	0.0595
Indonesia	0.0872	0.0139	0.1011
Kenya	0.0491	0.0079	0.0570
Madagascar	0.0376	0.0060	0.0436
Ethiopia	0.0171	0.0027	0.0199
Tanzania	0.0381	0.0061	0.0442
Ghana	0.0536	0.0086	0.0622

Table 4.49: Labor Cost in U.S. Dollars per Pair of Denim Jeans by Paying the Minimum Wages

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.3671	0.0587	0.4259
Vietnam	0.3189	0.0510	0.3700
India	0.1276	0.0204	0.1480
Bangladesh	0.1540	0.0246	0.1786
Indonesia	0.2616	0.0418	0.3034
Kenya	0.1474	0.0236	0.1710
Madagascar	0.1128	0.0180	0.1308
Ethiopia	0.0514	0.0082	0.0597
Tanzania	0.1144	0.0183	0.1327
Ghana	0.1608	0.0257	0.1865

4.2.1.3. Garment Finishing Cost

The cost of labor and water for finishing denim jeans were computed in U.S. dollars by paying minimum wages, respectively. Table 4.50 shows the total cost of finishing the denim jeans.

Table 4.50: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying the Minimum Wages

Country	Labor Cost ($)	Water Cost ($)	Total Cost ($)
China	0.0749	0.0409	0.1158
Vietnam	0.0651	0.0666	0.1317
India	0.0260	0.0121	0.0381
Bangladesh	0.0314	0.0304	0.0618
Indonesia	0.0534	0.0083	0.0617
Kenya	0.0301	0.0299	0.0599
Madagascar	0.0230	0.0277	0.0507
Ethiopia	0.0105	0.0156	0.0261
Tanzania	0.0233	0.0361	0.0595
Ghana	0.0328	0.1882	0.2210

4.2.1.4. Off-Quality Cost

The off-quality costs for T-shirts and denim jeans are shown in Table 4.51 and Table 4.52, respectively.

Table 4.51: Off-Quality Cost per T-shirt in U.S. Dollars by Paying the Minimum Wages

Country	Off-Quality Cost ($)
China	0.0330
Vietnam	0.0301
India	0.0300
Bangladesh	0.0308
Indonesia	0.0293
Kenya	0.0299
Madagascar	0.0297
Ethiopia	0.0290
Tanzania	0.0295
Ghana	0.0316

Table 4.52: Off-Quality Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Minimum Wages

Country	Off-Quality Cost ($)
China	0.2968
Vietnam	0.2680
India	0.2676
Bangladesh	0.2753
Indonesia	0.2617
Kenya	0.2729
Madagascar	0.2719
Ethiopia	0.2692
Tanzania	0.2711
Ghana	0.2903

4.2.2 Exit-Factory Cost

The exit-factory cost was calculated by using the Equation 2.4, which is the sum of the fabric, trims, apparel labor, apparel energy, garment finishing, and off-quality costs. For T-shirts, there were no garment finishing costs. Table 4.53 and Table 4.54 show the exit-factory cost for T-shirts and denim jeans by paying minimum wages, respectively.

Table 4.53: Exit-factory Cost per T-shirt in U.S. Dollars by Paying the Minimum Wages

Country	Exit Factory Cost ($)
China	1.6816
Vietnam	1.5362
India	1.5276
Bangladesh	1.5693
Indonesia	1.4968
Kenya	1.5224
Madagascar	1.5157
Ethiopia	1.4799
Tanzania	1.5050
Ghana	1.6120

Table 4.54: Exit-factory Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Minimum Wages

Country	Exit Factory Cost ($)
China	10.1911
Vietnam	9.2012
India	9.1874
Bangladesh	9.4515
Indonesia	8.9853
Kenya	9.3680
Madagascar	9.3343
Ethiopia	9.2418
Tanzania	9.3065
Ghana	9.9654

4.2.3. Garment Transportation Cost

The garment transportation cost to the U.S. was calculated using the World Freight Rate website (www.worldfreightrate.com). And the cheapest ports were identified for the cut and sew country and the U.S. in each supply chain (see Table 4.36). Capital cost was excluded in the transportation cost. The freight costs for each country per forty-foot container for T-shirts and denim jeans are shown in Table 4.55 and Table 4.56, respectively.

Table 4.55: T-shirt Transportation Costs to the U.S. Including Insurance by Paying the Minimum Wages

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/T-shirt ($)
China	3,856.88-4,262.86	0.1015
Vietnam	4,100.21-4,531.81	0.1079
India	4,037.66-4,462.68	0.1063
Bangladesh	4,317.45-4,771.91	0.1136
Indonesia	4,719.06-5,215.80	0.1242
Kenya	9,639.13-10,653.78	0.2537
Madagascar	9,484.68-10,483.06	0.2496
Ethiopia	10,948.03-12,100.45	0.2881
Tanzania	9,326.94-10,308.73	0.2454
Ghana	8,244.97-9,112.86	0.2170

Table 4.56: Denim Jeans Transportation Cost to the U.S. Including Insurance by Paying the Minimum Wages

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/Jeans ($)
China	5,601.94-6,191.62	0.3201
Vietnam	5,939.53-6,564.75	0.3394
India	5,879.23-6,498.10	0.3360
Bangladesh	6,213.75-6,867.83	0.3551
Indonesia	6,517.90-7,204.00	0.3725
Kenya	11,544.93-12,760.18	0.6597
Madagascar	11,384.53-12,582.90	0.6505
Ethiopia	12,845.65-14,197.82	0.7340
Tanzania	11,226.09-12,407.78	0.6415
Ghana	10,278.22-11,360.14	0.5873

4.2.4. Duty Cost

The duty percent for each country was shown in Table 4.39 and Table 4.40. Table 4.57 and Table 4.58 show the duty charges in dollars per T-shirt and per pair of denim jeans by paying minimum wages, respectively.

Table 4.57: Duty per T-shirt in U.S. Dollars by Paying the Minimum Wages

Country	Duty ($)
China	0.2775
Vietnam	0.2535
India	0.2521
Bangladesh	0.2589
Indonesia	0.2470
Kenya	0.0000
Madagascar	0.0000
Ethiopia	0.0000
Tanzania	0.0000
Ghana	0.0000

Table 4.58: Duty per Pair of Denim Jeans in U.S. Dollars by Paying the Minimum Wages

Country	Duty ($)
China	1.6917
Vietnam	1.5274
India	1.5251
Bangladesh	1.5690
Indonesia	1.4916
Kenya	0.0000
Madagascar	0.0000
Ethiopia	0.0000
Tanzania	0.0000
Ghana	0.0000

4.2.5. Landed Cost

The cost for T- shirts and denim jeans by paying minimum wages are displayed in Table 4.59 and Table 4.60, respectively.

Table 4.59: Landed Cost per T-shirt in U.S. Dollars by Paying the Minimum Wages

Country	Landed Cost ($)
China	2.0606
Vietnam	1.8976
India	1.8859
Bangladesh	1.9418
Indonesia	1.8680
Kenya	1.7760
Madagascar	1.7653
Ethiopia	1.7680
Tanzania	1.7504
Ghana	1.8290

Table 4.60: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Minimum Wages

Country	Landed Cost ($)
China	12.2030
Vietnam	11.0680
India	11.0485
Bangladesh	11.3756
Indonesia	10.8494
Kenya	10.0277
Madagascar	9.9848
Ethiopia	9.9759
Tanzania	9.9480
Ghana	10.5527

4.3. Applying Fiallos' (2009) Landed Cost Model by Paying Different Living Wages

This section calculates the landed cost using the living wages provided by three sources mentioned in section 4.1.1.3, respectively.

4.3.1. Exit FOB Cost

4.3.1.1. Total Fabric Cost, Trim Cost, Energy Cost

The total costs of fabric, trims, and energy for T-shirts and the denim jeans are the same as when paying the lowest living labor wages based on the equations.

4.3.1.2. Labor Cost

Table 4.61 shows the living wages of three sources. Table 4.62 shows the corresponding hourly apparel labor wages in U.S. dollars for 2016 by using the hourly rate formula mentioned in Section 4.1.1.3.

Table 4.61: Three Sources' Living Wages in U.S. Dollars for 2016

Country	GLWC Wage	Asia Floor Wage	WageIndicator.org Wage
China	412	574	-
Vietnam	172	274	221
India	133	169	162
Bangladesh	177	114	126
Indonesia	-	178	146
Kenya	138	-	297
Madagascar	-	-	121
Ethiopia	148	-	197
Tanzania	-	-	189
Ghana	207	-	198

Table 4.62: Three Sources' Hourly Labor Wages in U.S. Dollars for 2016

Country	GLWC Hourly Wage	Asia Floor Wage	WageIndicator.org Wage
China	2.1608	3.0105	-
Vietnam	0.8269	1.3173	1.0625
India	0.6394	0.8125	0.7788
Bangladesh	0.8510	0.5481	0.6058
Indonesia	-	0.9336	0.7657
Kenya	0.6635	-	0.6791
Madagascar	-	-	0.6346
Ethiopia	0.8757	-	1.1657
Tanzania	-	-	0.9087
Ghana	1.0857	-	1.0385

The labor costs for both T-shirts and denim jeans production were calculated by applying the three sources' labor wages from Table 4.62, and are shown in Table 4.63 and Table 4.64, respectively.

Table 4.63: Labor Cost in U.S. Dollars per T-shirt by Paying Different Living Wages

Country	Total Labor Cost by Paying GLWC Wage ($)	Total Labor Cost by Paying Asia Floor Wage ($)	Total Labor Cost by Paying WageIndicator.org Wage ($)
China	0.3823	0.5326	-
Vietnam	0.1463	0.2330	0.1880
India	0.1131	0.1437	0.1378
Bangladesh	0.1505	0.0970	0.1072
Indonesia	-	0.1652	0.1355
Kenya	0.1174	-	0.1201
Madagascar	-	-	0.1123
Ethiopia	0.1549	-	0.2062
Tanzania	-	-	0.1607
Ghana	0.1921	-	0.1837

Table 4.64: Labor Cost in U.S. Dollars per Pair of Denim Jeans by Paying Different Living Wages

Country	Total Labor Cost by Paying GLWC Wage ($)	Total Labor Cost by Paying Asia Floor Wage ($)	Total Labor Cost by Paying WageIndicator.org Wage ($)
China	1.1468	1.5977	-
Vietnam	0.4389	0.6991	0.5639
India	0.3394	0.4312	0.4133
Bangladesh	0.4516	0.2909	0.3215
Indonesia	-	0.4955	0.4064
Kenya	0.3521	-	0.3604
Madagascar	-	-	0.3368
Ethiopia	0.4648	-	0.6186
Tanzania	-	-	0.4822
Ghana	0.5762	-	0.5511

4.3.1.3. Garment Finishing Cost

The costs of labor and water for finishing denim jeans were computed in U.S. dollars by paying the three sources' living wages. Table 4.65 shows the total cost of finishing the denim jeans.

Table 4.65: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying Different Living Wages

Country	Total Finishing Cost by Paying GLWC Wage ($)	Total Finishing Cost by Paying Asia Floor Wage ($)	Total Finishing Cost by Paying WageIndicator.org Wage ($)
China	0.2426	0.3219	-
Vietnam	0.1438	0.1896	0.1658
India	0.0718	0.0879	0.0848
Bangladesh	0.1099	0.0816	0.0870
Indonesia	-	0.0955	0.0798
Kenya	0.0918	-	0.0932
Madagascar	-	-	0.0870
Ethiopia	0.0974	-	0.1244
Tanzania	-	-	0.1209
Ghana	0.2896	-	0.2852

4.3.1.4. Off-Quality Cost

The off-quality costs for T-shirts and denim jeans are shown in Table 4.66 and Table 4.67, respectively.

Table 4.66: Off-Quality Cost per T-shirt in U.S. Dollars by Paying Different Living Wages

Country	Off-Quality Cost by Paying GLWC Wage ($)	Off-Quality Cost by Paying Asia Floor Wage ($)	Off-Quality Cost by Paying WageIndicator.org Wage ($)
China	0.0378	0.0408	-
Vietnam	0.0306	0.0323	0.0314
India	0.0312	0.0318	0.0317
Bangladesh	0.0326	0.0315	0.0317
Indonesia	-	0.0306	0.0300
Kenya	0.0311	-	0.0311
Madagascar	-	-	0.0311
Ethiopia	0.0317	-	0.0327
Tanzania	-	-	0.0318
Ghana	0.0342	-	0.0340

Table 4.67: Off-Quality Cost per Pair of Denim Jeans in U.S. Dollars by Paying Different Living Wages

Country	Off-Quality Cost by Paying GLWC Wage ($)	Off-Quality Cost by Paying Asia Floor Wage ($)	Off-Quality Cost by Paying WageIndicator.org Wage ($)
China	0.3223	0.3382	-
Vietnam	0.2704	0.2796	0.2748
India	0.2743	0.2776	0.2770
Bangladesh	0.2849	0.2792	0.2803
Indonesia	-	0.2685	0.2653
Kenya	0.2792	-	0.2795
Madagascar	-	-	0.2791
Ethiopia	0.2835	-	0.2889
Tanzania	-	-	0.2834
Ghana	0.3040	-	0.3031

4.3.2. Exit-Factory Cost

Table 4.68 and Table 4.69 show the exit-factory costs for T-shirts and denim jeans by paying different living wages, respectively.

Table 4.68: Exit-factory Cost per T-shirt in U.S. Dollars by Paying Different Living Wages

Country	Exit Factory Cost by Paying GLWC Wage ($)	Exit Factory Cost by Paying Asia Floor Wage ($)	Exit Factory Cost by Paying WageIndicator.org Wage ($)
China	1.9267	2.0801	-
Vietnam	1.5596	1.6481	1.6021
India	1.5927	1.6239	1.6179
Bangladesh	1.6621	1.6075	1.6179
Indonesia	-	1.5621	1.5318
Kenya	1.5840	-	1.5868
Madagascar	-	-	1.5858
Ethiopia	1.6176	-	1.6699
Tanzania	-	-	1.6238
Ghana	1.7445	-	1.7360

Table 4.69: Exit-factory Cost per Pair of Denim Jeans in U.S. Dollars by Paying Different Living Wages

Country	Exit Factory Cost by Paying GLWC Wage ($)	Exit Factory Cost by Paying Asia Floor Wage ($)	Exit Factory Cost by Paying WageIndicator.org Wage ($)
China	11.0643	11.6104	-
Vietnam	9.2846	9.5998	9.4360
India	9.4192	9.5304	9.5088
Bangladesh	9.7822	9.5875	9.6246
Indonesia	-	9.2179	9.1101
Kenya	9.5874	-	9.5975
Madagascar	-	-	9.5837
Ethiopia	9.7325	-	9.9188
Tanzania	-	-	9.7298
Ghana	10.4374	-	10.4070

4.3.3 Garment Transportation Cost

The freight costs for each country per forty-foot container for T-shirts and denim jeans are shown in Table 4.70 and Table 4.71, respectively.

Table 4.70: T-shirt Transportation Costs to the U.S. Including Insurance by Paying Different Living Wages

Country	Transportation Cost/T-shirt by Paying GLWC Wage ($)	Transportation Cost/T-shirt by Paying Asia Floor Wage ($)	Transportation Cost/T-shirt by Paying WageIndicator.org Wage ($)
China	0.1059	0.1151	-
Vietnam	0.1084	0.1102	0.1093
India	0.1076	0.1083	0.1081
Bangladesh	0.1156	0.1144	0.1146
Indonesia	-	0.1256	0.1249
Kenya	0.2549	-	0.2550
Madagascar	-	-	0.2511
Ethiopia	0.2910	-	0.2921
Tanzania	-	-	0.2479
Ghana	0.2256	-	0.2196

Table 4.71: Denim Jeans Transportation Cost to the U.S. Including Insurance by Paying Different Living Wages

Country	Transportation Cost/Jeans by Paying GLWC Wage ($)	Transportation Cost/Jeans by Paying Asia Floor Wage ($)	Transportation Cost/Jeans by Paying WageIndicator.org Wage ($)
China	0.3342	0.3761	-
Vietnam	0.3410	0.3470	0.3439
India	0.3404	0.3425	0.3421
Bangladesh	0.3614	0.3577	0.3584
Indonesia	-	0.3769	0.3748
Kenya	0.6639	-	0.6641
Madagascar	-	-	0.6553
Ethiopia	0.7434	-	0.7469
Tanzania	-	-	0.6495
Ghana	0.5963	-	0.5957

4.3.4. Duty Cost

Table 4.72 and Table 4.73 show the duty charges in dollars per T-shirt and per pair of denim jeans, respectively, by paying different living wages.

Table 4.72: Duty per T-shirt in U.S. Dollars by Paying Different Living Wages

Country	Duty by Paying GLWC Wage ($)	Duty by Paying Asia Floor Wage ($)	Duty by Paying WageIndicator.org Wage ($)
China	0.3179	0.3432	-
Vietnam	0.2573	0.2719	0.2644
India	0.2628	0.2679	0.2669
Bangladesh	0.2742	0.2652	0.2669
Indonesia	-	0.2577	0.2528
Kenya	0.0000	-	0.0000
Madagascar	-	-	0.0000
Ethiopia	0.0000	-	0.0000
Tanzania	-	-	0.0000
Ghana	0.0000	-	0.0000

Table 4.73: Duty per Pair of Denim Jeans in U.S. Dollars by Paying Different Living Wages

Country	Duty by Paying GLWC Wage ($)	Duty by Paying Asia Floor Wage ($)	Duty by Paying WageIndicator.org Wage ($)
China	1.8367	1.9273	-
Vietnam	1.5412	1.5936	1.5664
India	1.5636	1.5821	1.5785
Bangladesh	1.6238	1.5915	1.5977
Indonesia	-	1.5302	1.5123
Kenya	0.0000	-	0.0000
Madagascar	-	-	0.0000
Ethiopia	0.0000	-	0.0000
Tanzania	-	-	0.0000
Ghana	0.0000	-	0.0000

4.3.5. Landed Cost

The costs for T- shirts and denim jeans by paying different wages are displayed in Table 4.74 and Table 4.75, respectively.

Table 4.74: Landed Cost per T-shirt in U.S. Dollars by Paying Different Living Wages

Country	Landed Cost by Paying GLWC Wage ($)	Landed Cost by Paying Asia Floor Wage ($)	Landed Cost by Paying WageIndicator.org Wage ($)
China	2.3505	2.5384	-
Vietnam	1.9254	2.0303	1.9758
India	1.9631	2.0001	1.9929
Bangladesh	2.0519	1.9871	1.9995
Indonesia	-	1.9454	1.9095
Kenya	1.8389	-	1.8418
Madagascar	-	-	1.8368
Ethiopia	1.9086	-	1.9620
Tanzania	-	-	1.8717
Ghana	1.9701	-	1.9555

Table 4.75: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying Different Living Wages

Country	Landed Cost by Paying GLWC Wage ($)	Landed Cost by Paying Asia Floor Wage ($)	Landed Cost by Paying WageIndicator.org Wage ($)
China	13.2352	13.9139	-
Vietnam	11.1668	11.5404	11.3463
India	11.3231	11.4550	11.4293
Bangladesh	11.7674	11.5367	11.5807
Indonesia	-	11.1250	10.9972
Kenya	10.2513	-	10.2616
Madagascar	-	-	10.2390
Ethiopia	10.4758	-	10.6658
Tanzania	-	-	10.3794
Ghana	11.0337	-	11.0028

CHAPTER 5: DISCUSSION, CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND FUTURE STUDY

5.1. Discussion

Labor wage is one of the important parts in determining sourcing costs. It has an impact on the cost of garment finishing, off-quality, garment transportation, and duty. As labor wages increase, these factors affected will also increase to varying degrees.

By comparing the lowest living wage with the lowest minimum wage, we found that except Ethiopia and Tanzania, the living wages are 1-3 times the minimum wage. This is shown in Table 5.1 and Table 5.2. The lowest living wage of Ethiopia is much higher than its minimum wage. However, China has the highest difference and percentage difference in landed costs for T-shirt and denim jeans. Vietnam is the country whose lowest living wage is closest to its minimum wage. So it has the minimum percentage change in landed cost for both T-shirts and denim jeans. Bangladesh's labor cost is very competitive compared to other countries, while the labor wage in Ghana is relatively high.

When comparing the living wages published by three sources (GLWC, Asia Floor and WageIndicator.org), the Asia Floor wage is generally higher than other two sources, followed by WageIndicator.org wage and then the GLWC wage. Regardless of the source, the increase in living wages from minimum wages in Sub-Saharan African countries is generally larger than that of Asian countries

Table 5.1: The Percentage Difference for T-shirt Between the Minimum Wage and the Lowest Living Wage

Country	Minimum Wage	Lowest Living Wage	Difference	% Difference	T-shirt's Cost with Minimum Wage	T-shirt's Cost with Lowest Living Wage	Difference	% Difference
China	0.1420	0.3823	0.2403	169.23%	2.0606	2.3505	0.290	14.07%
Vietnam	0.1233	0.1463	0.0230	18.65%	1.8976	1.9254	0.028	1.47%
India	0.0493	0.1131	0.0638	129.41%	1.8859	1.9631	0.077	4.09%
Bangladesh	0.0595	0.0970	0.0375	63.03%	1.9418	1.9871	0.045	2.33%
Indonesia	0.1011	0.1355	0.0344	34.03%	1.8680	1.9095	0.063	2.22%
Kenya	0.0570	0.1174	0.0604	105.96%	1.7760	1.8389	0.063	3.54%
Madagascar	0.0436	0.1123	0.0687	157.57%	1.7653	1.8368	0.071	4.05%
Ethiopia	0.0199	0.1549	0.1350	678.39%	1.7680	1.9086	0.141	7.95%
Tanzania	0.0442	0.1607	0.1165	263.57%	1.7504	1.8717	0.121	6.93%
Ghana	0.0622	0.1837	0.1215	195.34%	1.8290	1.9555	0.127	6.92%

Table 5.2: The Percentage Difference for Denim Jeans Between the Minimum Wage and the Lowest Living Wage

Country	Minimum Wage	Lowest Living Wage	Difference	% Difference	Jeans' Cost with Minimum Wage	Jeans' Cost with Lowest Living Wage	Difference	% Difference
China	0.4259	1.1468	0.7209	169.27%	12.2030	13.2352	1.032	8.46%
Vietnam	0.3700	0.4389	0.0689	18.62%	11.0680	11.1668	0.099	0.89%
India	0.1480	0.3394	0.1914	129.32%	11.0485	11.3231	0.275	2.49%
Bangladesh	0.1786	0.2909	0.1123	62.88%	11.3756	11.5367	0.161	1.42%
Indonesia	0.3034	0.4064	0.1030	33.95%	10.8494	10.9972	0.224	1.36%
Kenya	0.1710	0.3521	0.1811	105.91%	10.0277	10.2513	0.224	2.23%
Madagascar	0.1308	0.3368	0.2060	157.49%	9.9848	10.2390	0.254	2.55%
Ethiopia	0.0597	0.4648	0.4051	678.56%	9.9759	10.4758	0.500	5.01%
Tanzania	0.1327	0.4822	0.3495	263.38%	9.9480	10.3794	0.431	4.34%
Ghana	0.1865	0.5511	0.3646	195.50%	10.5527	11.0028	0.450	4.27%

Figure 5.1 to Figure 5.10 show hourly wages versus landed costs for T-shirts and denim jeans with different wages.

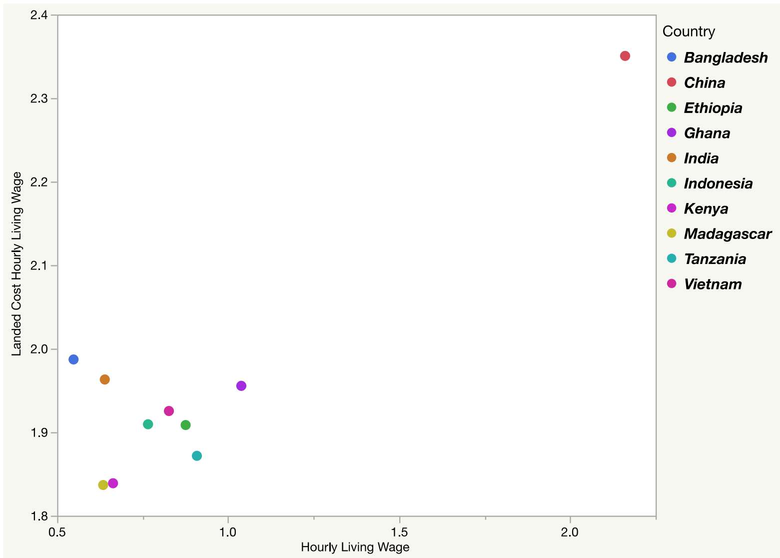

Figure 5.1. Hourly Lowest Living Wages versus Landed Costs for T-shirts

Figure 5.1 shows that when examining the lowest living wages, Madagascar and Kenya have very close labor wages and landed cost. Even though Bangladesh has the lowest labor wage, its landed cost ranks second highest because of high fabric and duty costs.

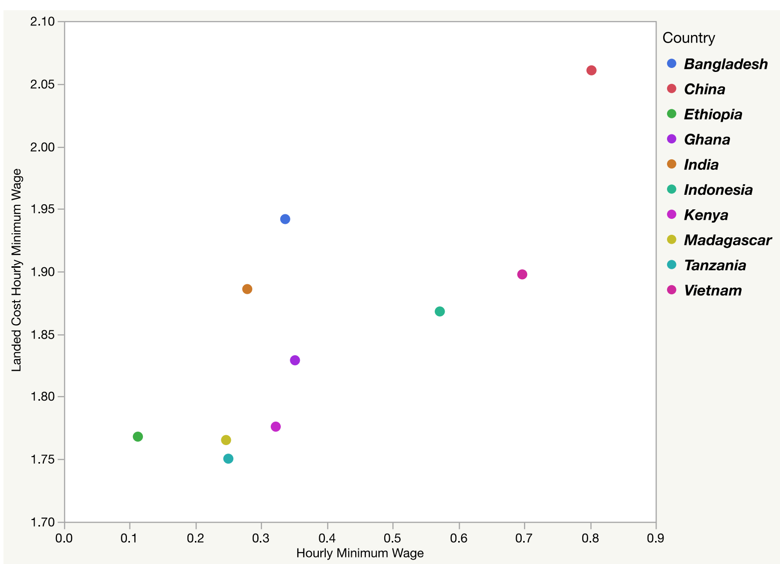

Figure 5.2. Hourly Minimum Wages versus Landed Costs for T-shirts

Figure 5.2 shows that Ethiopia has the lowest minimum wage, but the landed cost for T-shirt is higher than Madagascar and Tanzania due to higher fabric and garment transportation costs. Bangladesh has a relatively low minimum labor wage, but its landed cost is higher than that of most countries because of its higher fabric and garment transportation costs. Indonesia is just the opposite of Bangladesh. Its minimum labor wage is relatively high, however, its landed cost is the lowest among Asian countries because Indonesia has much lower fabric costs.

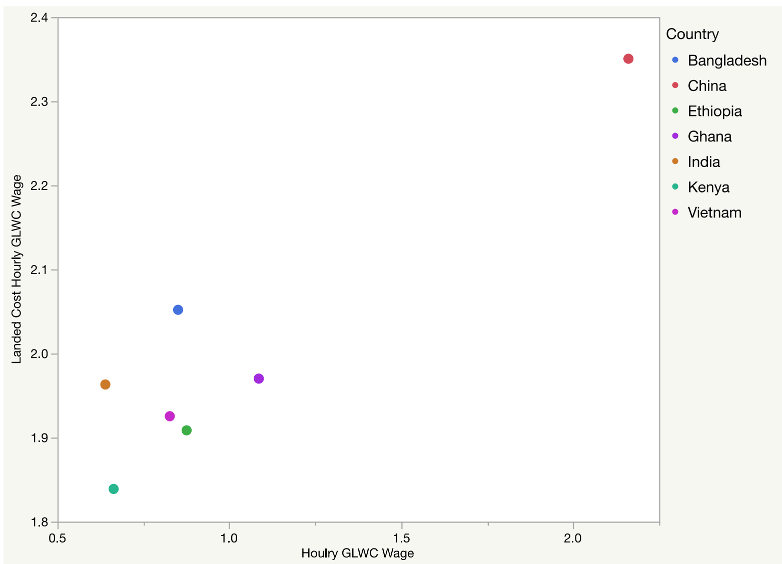

Figure 5.3. Hourly GLWC Wages versus Landed Costs for T-shirts

Figure 5.3 shows that when analyzing GLWC wages, Kenya has the second lowest labor wage and lowest landed cost for T-shirts. The GLWC labor wage of India is the lowest. However, its landed cost is higher than Kenya, Ethiopia and Vietnam because of higher energy and fabric costs.

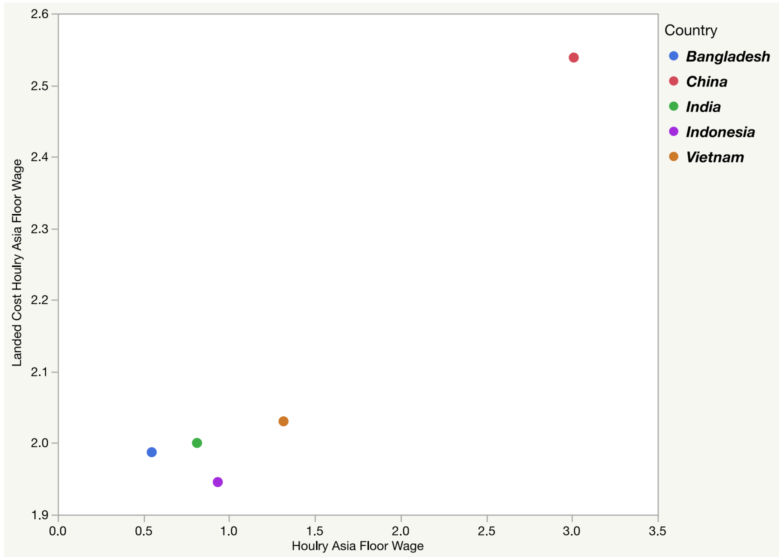

Figure 5.4. Hourly Asia Floor Wages versus Landed Costs for T-shirts

Figure 5.4 shows that when examining Asia Floor wages, Indonesia has a relatively high labor wage but has the lowest landed cost among Asian countries because it has the lowest fabric cost.

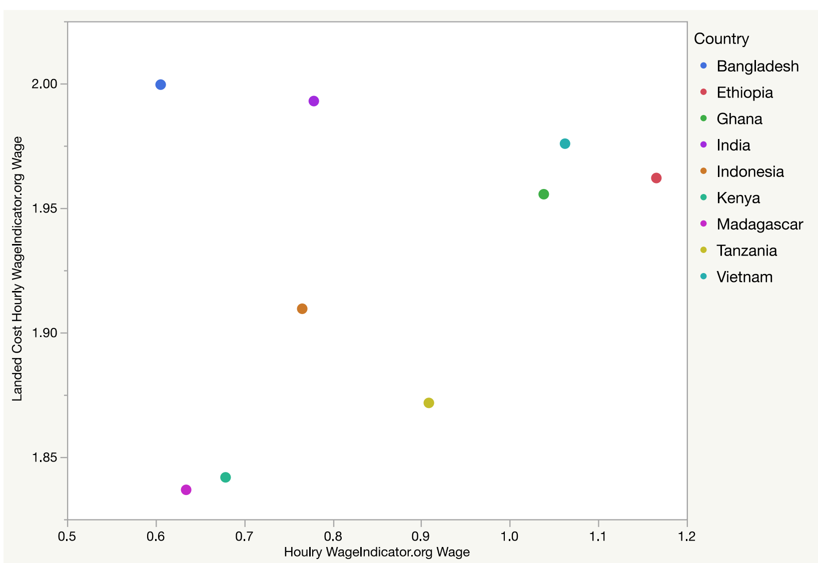

Figure 5.5. Hourly WageIndicator.org Wages versus Landed Costs for T-shirts

Figure 5.5 shows that with respect to WageIndicator.org wages, Ethiopia has the most expensive labor wage. Bangladesh has the least expensive WageIndicator.org labor wage, but its landed cost is highest among all the country.

Figure 5.1 to Figure 5.5 show that China always has the highest labor wage and landed cost, compared with other countries. Bangladesh has a very high landed cost compared to its relatively low hourly labor wage. When paying Asia Floor wages, the landed costs of India and Vietnam are greater than that of Bangladesh. The landed cost of Ethiopia rises a lot when paying the WageIndicator.org wage. The labor costs in most Sub-Saharan African countries are lower than Asian countries. The Asia Floor wage has the widest range of living wages.

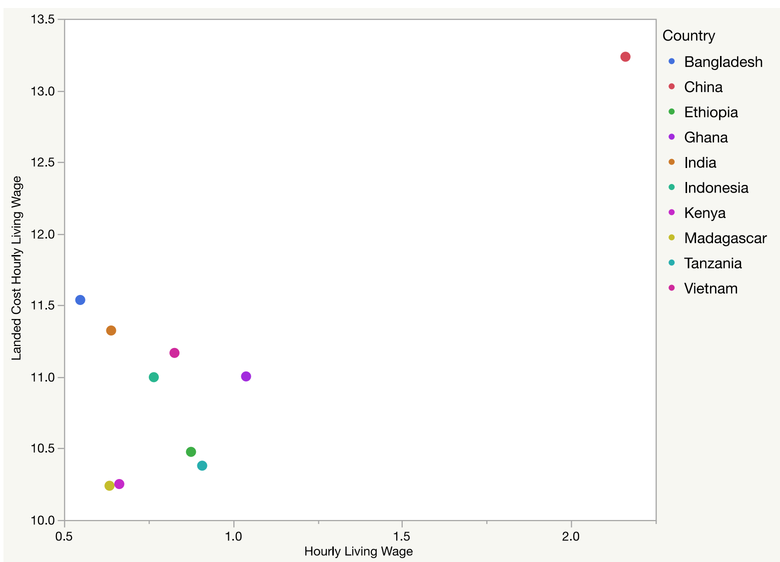

Figure 5.6. Hourly Lowest Living Wages versus Landed Cost for Denim Jeans

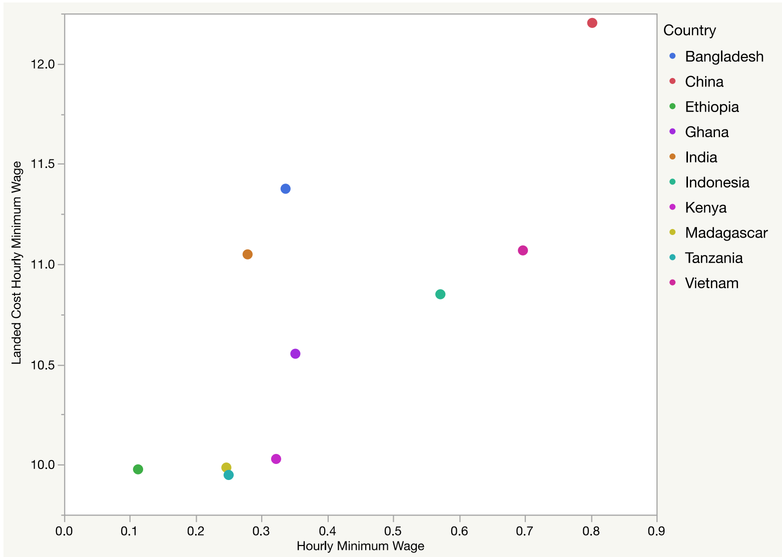

Figure 5.7. Hourly Minimum Wages versus Landed Cost for Denim Jeans

Figure 5.6 and Figure 5.7 show that the situation for denim jeans of each country is similar to T-shirts when paying the lowest living wages and minimum wages, respectively.

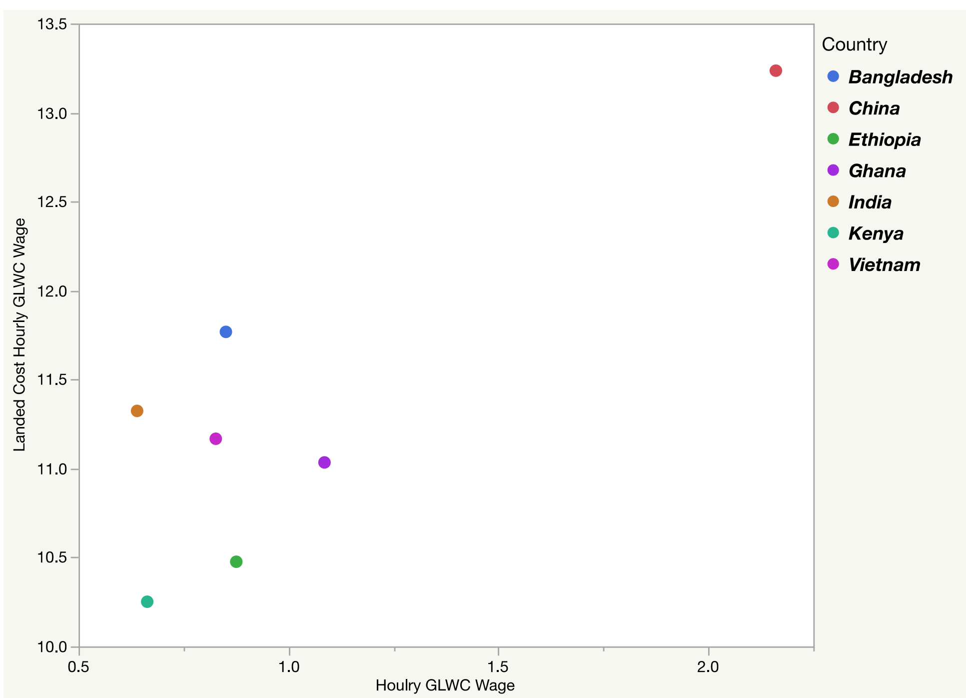

Figure 5.8. Hourly GLWC Wages versus Landed Cost for Denim Jeans

Figure 5.8 shows that the landed cost of denim jeans for Vietnam is greater than that for Ghana when paying GLWC wages, which is different than the landed costs for T-shirts.

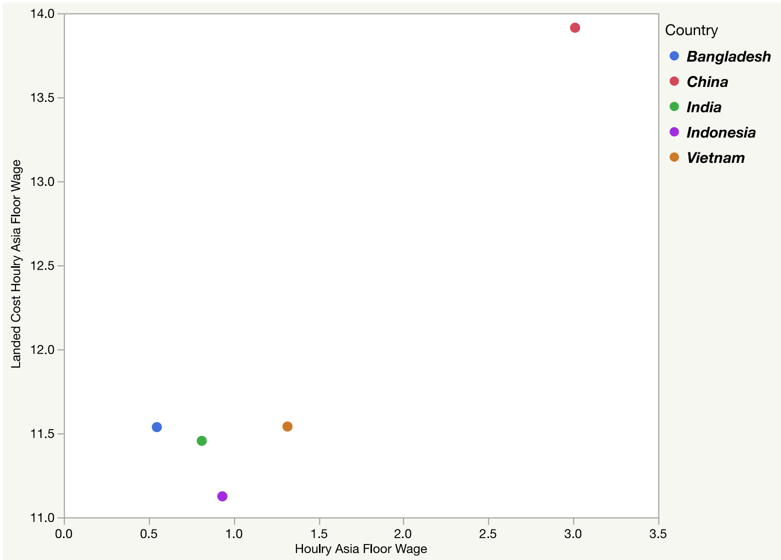

Figure 5.9. Hourly Asia Floor Wages versus Landed Cost for Denim Jeans

Figure 5.9 shows that even though India has a higher Asia Floor labor cost, its denim jeans landed cost is still lower than Bangladesh because of the transportation costs to ship the fabric from India to Bangladesh.

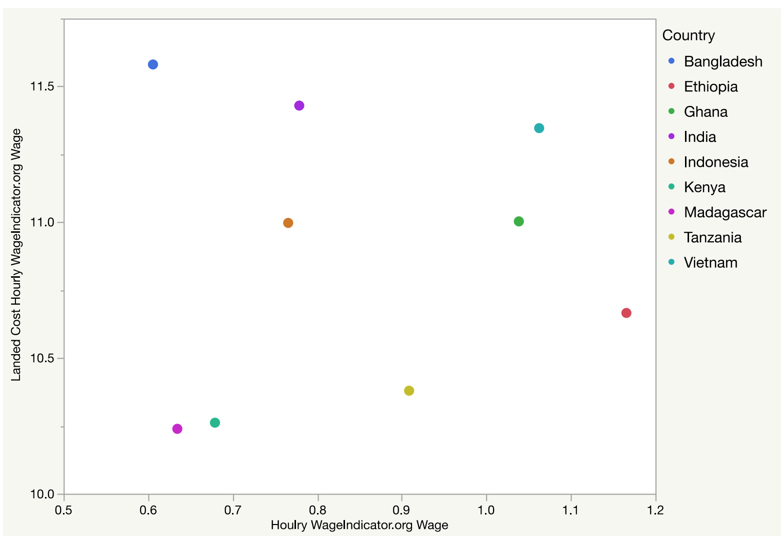

Figure 5.10. Hourly WageIndicator.org Wages versus Landed Cost for Denim Jeans

Figure 5.10 shows that when using WageIndicator.org wages, the landed cost of denim jeans for Ethiopia is lower than Kenya, which differs from the T-shirt analysis. This is due to Ethiopia's lower energy cost.

Figure 5.6 to 5.10 show that China is always most expensive in hourly labor wages and landed costs. Bangladesh's hourly labor wage is the lowest when paying the lowest living wage, the Asia Floor wage and the WageIndicator.org wage. The labor wages in most of Sub-Saharan African countries are lower than in Asian countries.

Figure 5.11 to Figure 5.15 show the landed costs in order of most expensive country to the least expensive country for T-shirts when paying the lowest living wage, minimum wage, GLWC wage, Asia Floor wage, and WageIndicator.org wage, respectively.

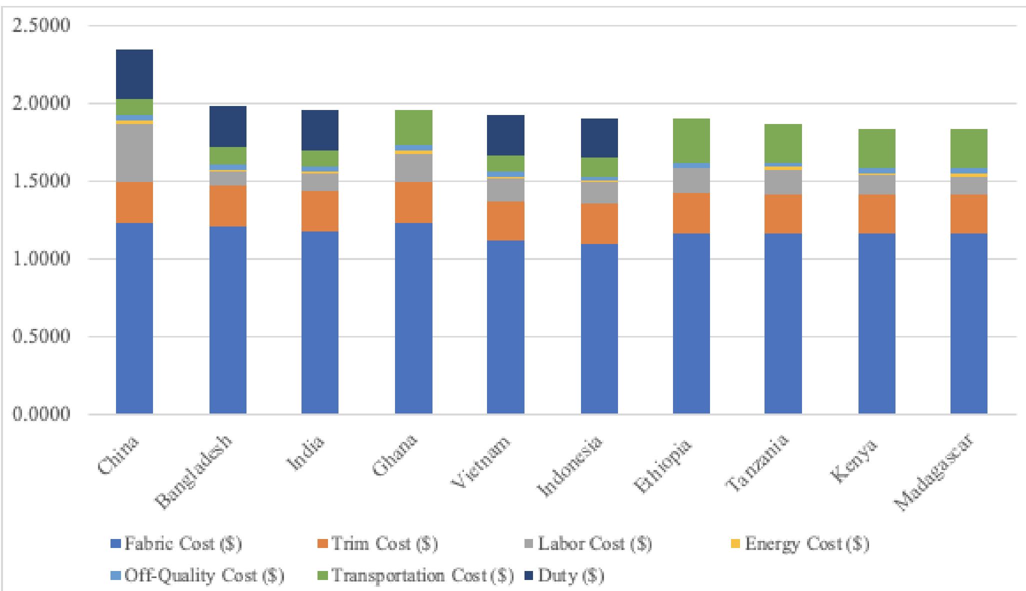

Figure 5.11. Landed Cost for T-shirts in Order of Most Expensive to Least Expensive by Paying the Lowest Living Wage

Figure 5.11 shows that when paying the lowest living wage, Madagascar ranks the least expensive. Vietnam and Indonesia are both less expensive than Ghana and other Asian Countries.

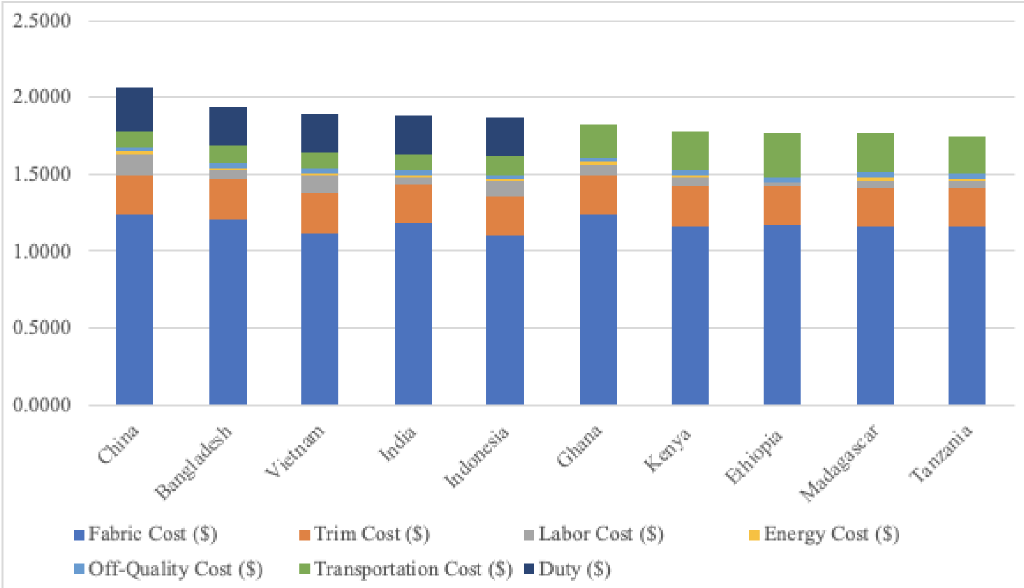

Figure 5.12. Landed Cost for T-shirts in Order of Most Expensive to Least Expensive by Paying the Minimum Wage

Figure 5.12 shows that when paying minimum wages, the landed cost of T-shirts for China is much higher than other countries, mainly due to China having the highest labor wage. The landed cost of Bangladesh follows China, and Tanzania ranks the least expensive. All of the landed costs of SSA countries are lower than Asian countries. The garment transportation costs for T-shirts of SSA countries are all more expensive than those of Asian countries. However, duty-free access under AGOA (shown in dark blue) largely decreases the landed cost of the SSA countries and enhances the competitiveness of them.

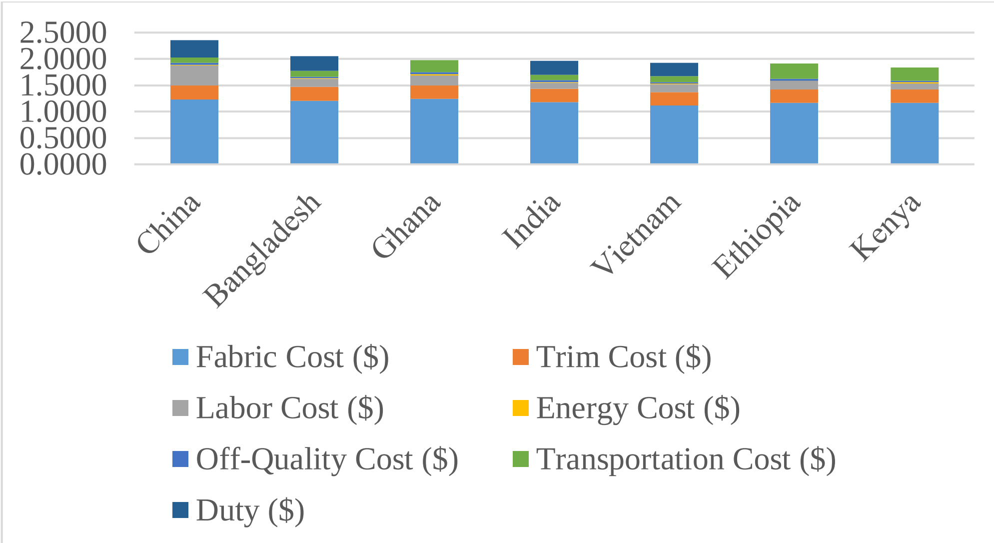

Figure 5.13. Landed Cost for T-shirt in Order of Most Expensive to Least Expensive by Paying the GLWC Wage

Figure 5.13 shows that when paying GLWC wages, the landed cost of T-shirts for China is much higher than other countries. The landed cost of Ghana is greater than the landed costs of India and Vietnam, and Kenya ranks the least expensive.

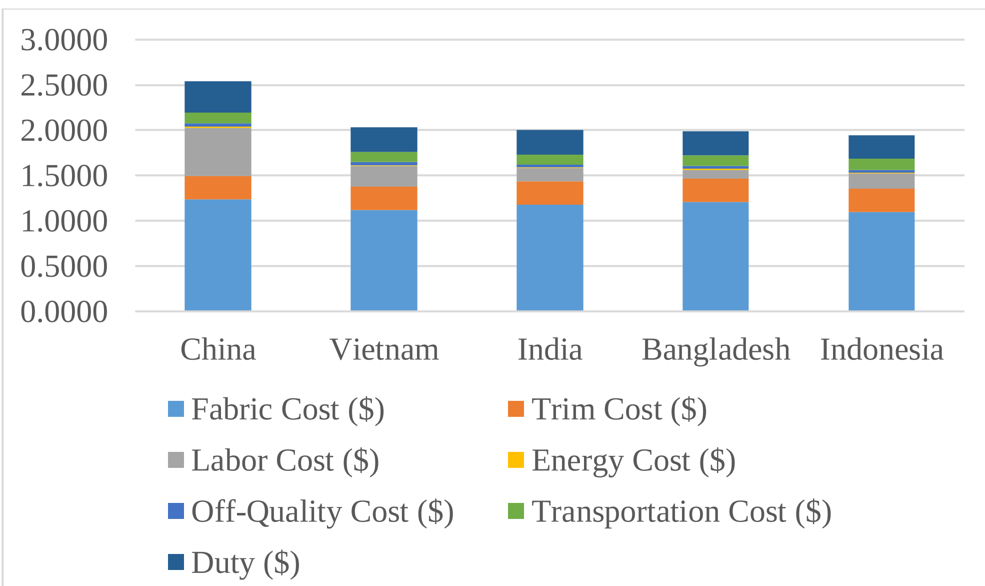

Figure 5.14. Landed Cost for T-shirt in Order of Most Expensive to Least Expensive by Paying the Asia Floor Wage

Figure 5.14 show that when Asia Floor wages are paid, Vietnam and India are between China and Bangladesh. Indonesia has the lowest landed cost in Asia.

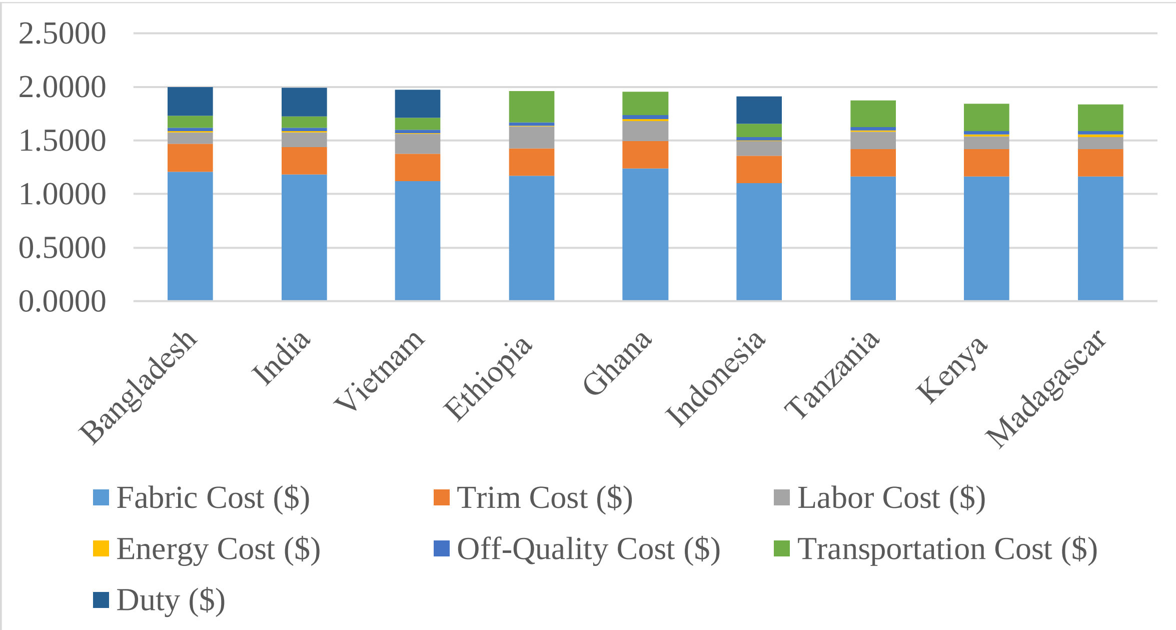

Figure 5.15. Landed Cost for T-shirt in Order of Most Expensive to Least Expensive by Paying the WageIndicator.org Wage

Figure 5.15 shows that when WageIndicator wages are paid, the cost competitiveness of Ethiopia decreases a lot. Madagascar has the lowest landed cost.

Figure 5.11 to Figure 5.15 show that for sourcing T-shirts, all of the landed costs of Asian countries are higher than the SSA countries, except for Ghana. China is much more expensive than other countries mainly due to the highest living wages. The landed cost of Bangladesh follows China when minimum wages and GLWC wages are paid. In contrast, when the Asia Floor wages are paid, Vietnam and India are between China and Bangladesh. Indonesia always has the lowest landed cost in Asia. In addition, the garment transportation costs for T-shirts of SSA countries are all more expensive than for the Asian countries. However, duty-free access under AGOA, largely decreases the landed cost of the SSA countries and enhances the competitiveness of them.

Table 5.3 presents the country rankings for T-shirts when paying different wages. The number 1 represents the least expensive.

Table 5.3: Country Rankings for T-shirts when Paying Different Wages

Country	Minimum Wage	Lowest Living Wage	GLWC Wage	Asia Floor Wage	WageIndicator.org Wage
Tanzania	1	3	-	-	3
Madagascar	2	1	-	-	1
Ethiopia	3	4	2	-	6
Kenya	4	2	1	-	2
Ghana	5	7	5	-	5
Indonesia	6	5	-	1	4
India	7	8	4	3	8
Vietnam	8	6	3	4	7
Bangladesh	9	9	6	2	9
China	10	10	7	5	-

As shown in Table 5.3, China always ranks the most expensive. Compared to other living wages, Bangladesh's ranking is best when paying the Asia Floor wage. However, Vietnam's ranking is worst when paying the Asia Floor wage. Compared with paying the lowest living wage, the ranking of Ethiopia worsens a lot when paying the WageIndicator.org wage.

Figure 5.16 to Figure 5.20 show the landed cost in order of most expensive country to the least expensive country for denim jeans when paying the lowest living wage, minimum wage, GLWC wage, Asia Floor wage, and WageIndicator.org wage, respectively.

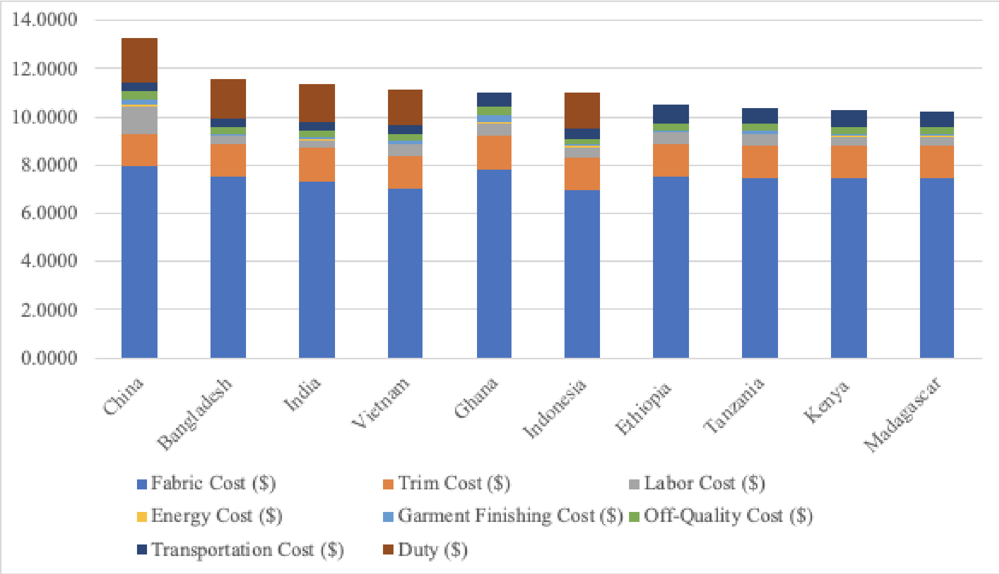

Figure 5.16. Landed Cost for Denim Jeans in Order of Most Expensive to Least Expensive by Paying the Lowest Living Wage

Figure 5.16 shows that when paying the lowest living wage, Madagascar ranks the least expensive. Indonesia is the only Asian country that is less expensive than a SSA country, and Ghana is the only SSA country which Indonesia is less expensive than.

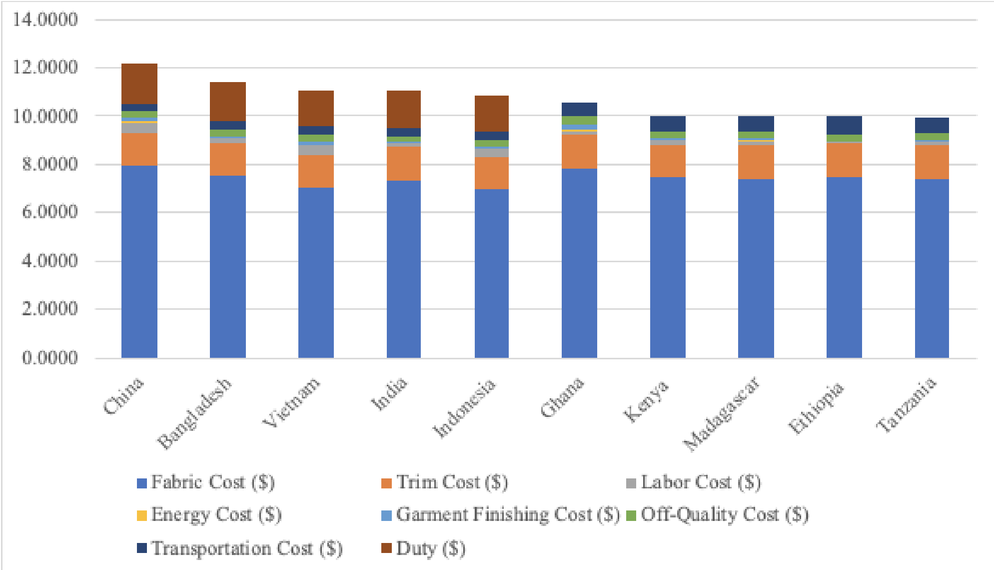

Figure 5.17. Landed Cost for Denim Jeans in Order of Most Expensive to Least Expensive by Paying the Minimum Wage

Figure 5.17 shows that when paying minimum wages, the landed cost of denim jeans for China ranks the most expensive followed by Bangladesh. Tanzania is least expensive, and Indonesia is the least expensive among Asian countries. All of the landed costs of SSA countries are lower than those of Asian countries.

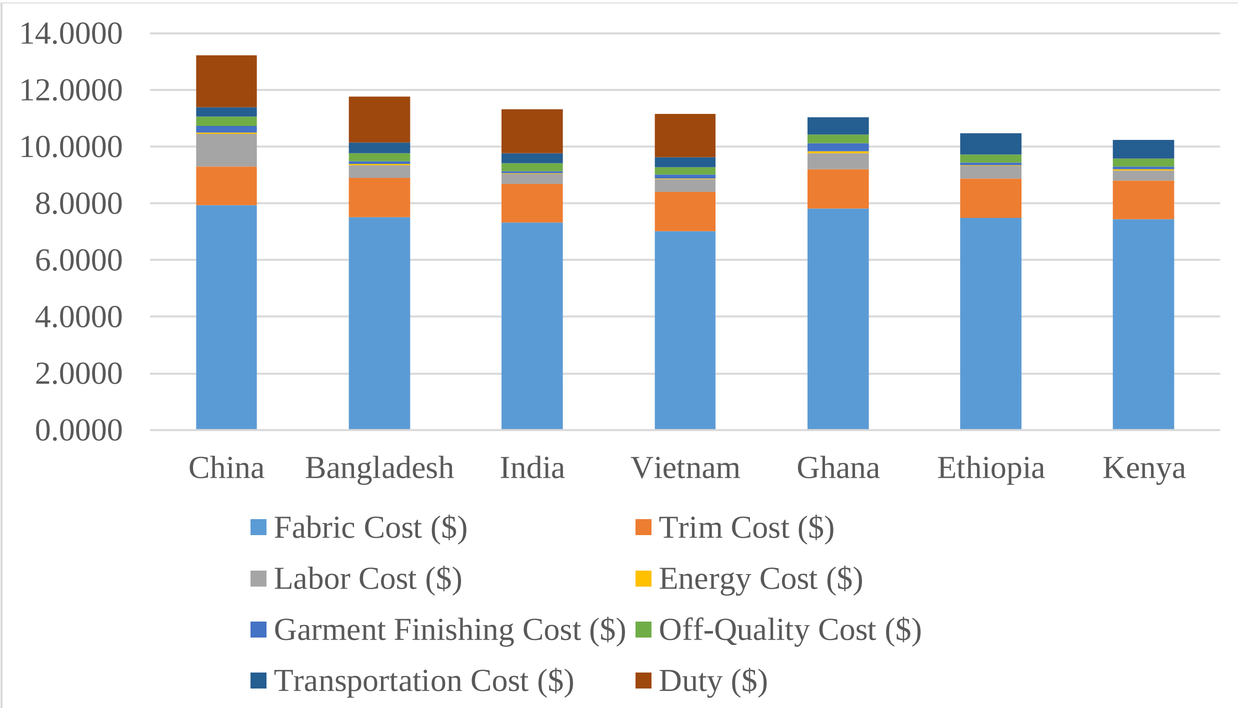

Figure 5.18. Landed Cost for Denim Jeans in Order of Most Expensive to Least Expensive by Paying the GLWC Wage

Figure 5.18 shows that when paying GLWC wages, all of the denim jeans landed costs of SSA countries are lower than those of Asian countries. Kenya ranks the least expensive.

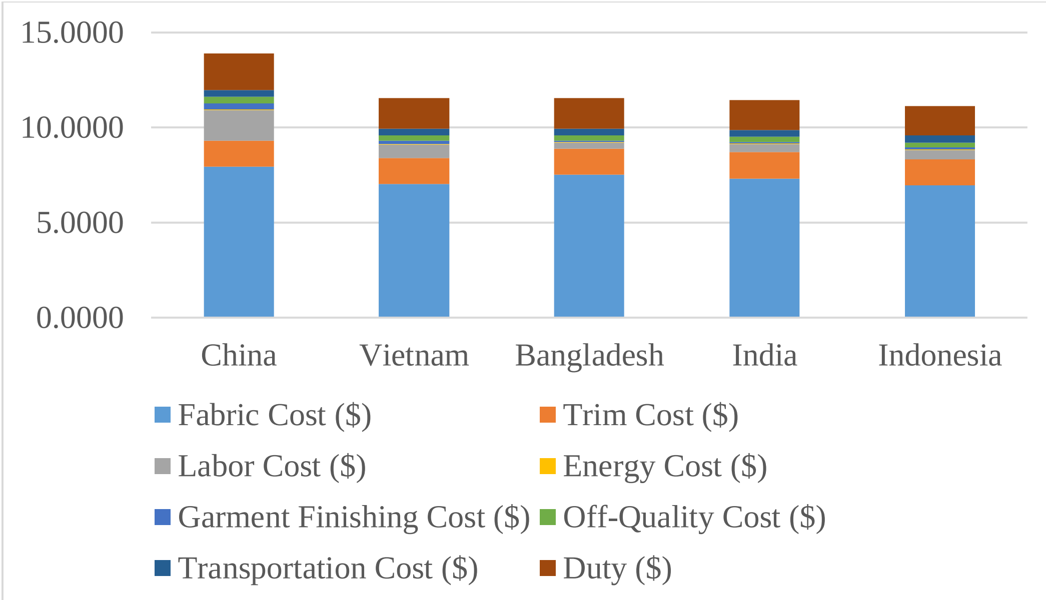

Figure 5.19. Landed Cost for Denim Jeans in Order of Most Expensive to Least Expensive by Paying the Asia Floor Wage

Figure 5.19 shows that when paying Asia Floor wages, the denim jeans landed cost of Vietnam is greater than Bangladesh and follows China. Indonesia is the least expensive country.

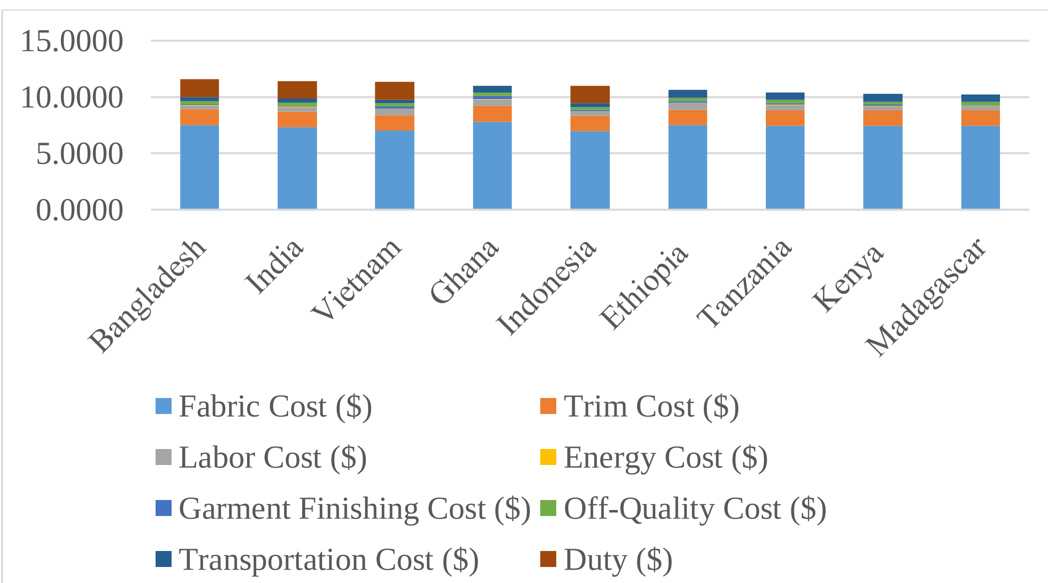

Figure 5.20. Landed Cost for Denim Jeans in Order of Most Expensive to Least Expensive by Paying the WageIndicator.org Wage

Figure 5.20 shows that when paying the WageIndicator wages, most Asian countries have higher denim jeans landed cost than SSA countries, except Indonesia.

Figure 5.16 to Figure 5.20 show that for denim jeans, all of the landed costs of Asian countries are higher than SSA countries, except Ghana. China has the highest landed cost mainly due to having the highest living wages. The landed cost of Bangladesh follows China when minimum wages and GLWC wages are paid. In contrast, when the Asia Floor wages are paid, Vietnam is between China. Indonesia always has the lowest landed cost in Asia. The garment transportation costs for denim jeans of SSA countries are all more expensive than for Asian countries. Duty-free access largely decreases the landed cost of the SSA countries and increases their competitiveness.

Table 5.4 presents the country rankings for denim jeans when paying different wages. The number 1 represents the least expensive.

Table 5.4: Country Rankings for Denim Jeans when Paying Different Wages

Country	Minimum Wage	Lowest Living Wage	GLWC Wage	Asia Floor Wage	WageIndicator.org Wage
Tanzania	1	3	-	-	3
Ethiopia	2	4	2	-	4
Madagascar	3	1	-	-	1
Kenya	4	2	1	-	2
Ghana	5	6	3	-	6
Indonesia	6	5	-	1	5
India	7	8	5	2	8
Vietnam	8	7	4	4	7
Bangladesh	9	9	6	3	9
China	10	10	7	5	-

As shown in Table 5.4, China always ranks the most expensive. Compared to other living wages, Vietnam's ranking is worst when paying Asia Floor wage. Compared to paying the minimum wage, the ranking of Ethiopia worsens a lot.

5.2. Conclusion

The detailed landed cost model used in this paper is Adikorely's (2016) adaption of Fiallos' (2009) cost model. This study analyzed the landed cost for T-shirt and denim jeans for 10 countries (five Asia countries and five SSA countries) with different supply chains by paying different living wages.

The landed costs of each country were compared using each type of labor wage, and the country rankings were compared across the different labor wages. Except Ghana, SSA countries ranked best for T-shirts and denim jeans because they had the lowest landed cost when compared with Asian countries for all of the different labor wages.

The results also demonstrated that when comparing the living wages published by three sources, the Asia Floor wages are generally highest followed by the WageIndicator.org wages and then the GLWC wages. Even though the garment transportation costs for T-shirts of SSA countries are all more expensive than for the Asian countries, duty-free access under AGOA, largely decreases the landed cost of the SSA countries and enhances the competitiveness of them. For sourcing T-shirts and denim jeans, apparel manufacturing in SSA countries was found to be cost competitive when compared to Asian countries from which the U.S. often sources apparel, except Ghana because of its high labor wage. The labor costs in most Sub-Saharan African countries are always lower than Asian countries. China has the highest labor wage and landed cost compared to other countries when paying different living wages. Compared to paying the minimum wage, the cost competitiveness of Ethiopia decreases a lot when using WageIndicator living wages.

5.3. Implication

The findings of this research are practical for academia, apparel brands and retailers, and policy makers.

This research adds to the limited academic literature on sourcing from Asia and SSA countries by paying living wages. It provides a picture of sourcing basic apparel from Asia and SSA countries by comparing the landed costs, and the impact of living wages. It provides a foundation on which several studies could be conducted to overcome the challenges revealed from this study.

To apparel brands and retailers, this paper offers possible sourcing strategies. For example, from the landed cost analysis, China is the most expensive place to source basic apparel under any wages, while Indonesia is cost competitive when paying different living wages. Bangladesh and India also are potential souring places. Most of the SSA countries are the least expensive places, and the cost competitiveness enhances as the labor wage increases. Apparel brands can use this cost analysis to guide sourcing decisions.

For policy makers, this paper shows how cost competitive their individual countries are in producing garments for the U.S. market when paying different wages. More support in favor of paying living wages in textiles and apparel industry could result in economic growth, workers' life satisfaction enhancement and country's visibility increase in the global sourcing.

5.4. Limitations and Future Study

Using Fiallos (2009) cost model, this study analyzed the impact of living wages on landed cost for sourcing basic apparel in different textile and apparel supply chains.

There are some limitations.

1. Steam costs and water costs for weaving were used for knitting due to not being able to find these costs.
2. Capital cost was not included in this study.
3. Data used in this study was in U.S. dollars. The exchange rates continuously fluctuate.
4. Only ten countries (five countries from Asia, five countries form SSA) in three situations (minimum wages, living wages and three sources living wages) were analyzed to explore the impact of paying living wage.
5. The products studied were only basic garments (T-shirt and denim jeans). The yarn and fabric for most of the SSA countries is assumed to be made in Indonesia.
6. The landed costs calculated were only point estimates. No variability estimates were available.

There are several areas of possible future research.

1. When studying the impact of paying living wages on sourcing, Latin American and Caribbean countries can also be taken into consideration. The number of countries analyzed can be increased.
2. More living labor wages can also be analyzed to have a deeper understanding of the impact of living wages.
3. Not only basic apparel, but also some fashion products can be investigated.
4. Different yarn and fabric countries should be analyzed in constructing SSA supply chains.
5. The cost model could be validated with an apparel manufacturer.

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APPENDICES

Appendix A: Landed Cost per T-shirt and per Pair of Denim Jeans in U.S. Dollars by Paying the Lowest Living Wage

Table A.1: Landed Cost per T-shirt in U.S. Dollars by the Paying Lowest Living Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	1.2350	0.2567	0.3823	0.0150	0.0378	0.1059	0.3179	2.3505
Vietnam	1.1175	0.2567	0.1463	0.0086	0.0306	0.1084	0.2573	1.9254
India	1.1805	0.2567	0.1131	0.0111	0.0312	0.1076	0.2628	1.9631
Bangladesh	1.2101	0.2567	0.0970	0.0122	0.0315	0.1144	0.2652	1.9871
Indonesia	1.0995	0.2567	0.1355	0.0101	0.0300	0.1249	0.2528	1.9095
Kenya	1.1621	0.2567	0.1174	0.0167	0.0311	0.2549	0.0000	1.8389
Madagascar	1.1614	0.2567	0.1123	0.0243	0.0311	0.2511	0.0000	1.8368
Ethiopia	1.1688	0.2567	0.1549	0.0055	0.0317	0.2910	0.0000	1.9086
Tanzania	1.1606	0.2567	0.1607	0.0139	0.0318	0.2479	0.0000	1.8717
Ghana	1.2379	0.2567	0.1837	0.0236	0.0340	0.2196	0.0000	1.9555

Table A.2: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Lowest Living Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Garment Finishing Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	7.9278	1.3799	1.1468	0.0449	0.2426	0.3223	0.3342	1.8367	13.2352
Vietnam	7.0254	1.3799	0.4389	0.0262	0.1438	0.2704	0.3410	1.5412	11.1668
India	7.3201	1.3799	0.3394	0.0337	0.0718	0.2743	0.3404	1.5636	11.3231
Bangladesh	7.5192	1.3799	0.2909	0.0367	0.0816	0.2792	0.3577	1.5915	11.5367
Indonesia	6.9487	1.3799	0.4064	0.0300	0.0798	0.2653	0.3748	1.5123	10.9972
Kenya	7.4342	1.3799	0.3521	0.0502	0.0918	0.2792	0.6639	0.0000	10.2513
Madagascar	7.4279	1.3799	0.3368	0.0730	0.0870	0.2791	0.6553	0.0000	10.2390
Ethiopia	7.4905	1.3799	0.4648	0.0165	0.0974	0.2835	0.7434	0.0000	10.4758
Tanzania	7.4217	1.3799	0.4822	0.0417	0.1209	0.2834	0.6495	0.0000	10.3794
Ghana	7.8169	1.3799	0.5511	0.0709	0.2852	0.3031	0.5957	0.0000	11.0028

Appendix B: Landed Cost per T-shirt and per Pair of Denim Jeans in U.S. Dollars by Paying the Minimum Wage

Table B.1: Landed Cost per T-shirt in U.S. Dollars by Paying the Minimum Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	1.2350	0.2567	0.1420	0.0150	0.0330	0.1015	0.2775	2.0606
Vietnam	1.1175	0.2567	0.1233	0.0086	0.0301	0.1079	0.2535	1.8976
India	1.1805	0.2567	0.0493	0.0111	0.0300	0.1063	0.2521	1.8859
Bangladesh	1.2101	0.2567	0.0595	0.0122	0.0308	0.1136	0.2589	1.9418
Indonesia	1.0995	0.2567	0.1011	0.0101	0.0293	0.1242	0.2470	1.8680
Kenya	1.1621	0.2567	0.0570	0.0167	0.0299	0.2537	0.0000	1.7760
Madagascar	1.1614	0.2567	0.0436	0.0243	0.0297	0.2496	0.0000	1.7653
Ethiopia	1.1688	0.2567	0.0199	0.0055	0.0290	0.2881	0.0000	1.7680
Tanzania	1.1606	0.2567	0.0442	0.0139	0.0295	0.2454	0.0000	1.7504
Ghana	1.2379	0.2567	0.0622	0.0236	0.0316	0.2170	0.0000	1.8290

Table B.2: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Minimum Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Garment Finishing Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	7.9278	1.3799	0.4259	0.0449	0.1158	0.2968	0.3201	1.6917	12.2030
Vietnam	7.0254	1.3799	0.3700	0.0262	0.1317	0.2680	0.3394	1.5274	11.0680
India	7.3201	1.3799	0.1480	0.0337	0.0381	0.2676	0.3360	1.5251	11.0485
Bangladesh	7.5192	1.3799	0.1786	0.0367	0.0618	0.2753	0.3551	1.5690	11.3756
Indonesia	6.9487	1.3799	0.3034	0.0300	0.0617	0.2617	0.3725	1.4916	10.8494
Kenya	7.4342	1.3799	0.1710	0.0502	0.0599	0.2729	0.6597	0.0000	10.0277
Madagascar	7.4279	1.3799	0.1308	0.0730	0.0507	0.2719	0.6505	0.0000	9.9848
Ethiopia	7.4905	1.3799	0.0597	0.0165	0.0261	0.2692	0.7340	0.0000	9.9759
Tanzania	7.4217	1.3799	0.1327	0.0417	0.0595	0.2711	0.6415	0.0000	9.9480
Ghana	7.8169	1.3799	0.1865	0.0709	0.2210	0.2903	0.5873	0.0000	10.5527

Appendix C: Landed Cost per T-shirt and per Pair of Denim Jeans in U.S. Dollars by Paying the GLWC Wage

Table C.1: Landed Cost per T-shirt in U.S. Dollars by Paying the GLWC Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	1.2350	0.2567	0.3823	0.0150	0.0378	0.1059	0.3179	2.3505
Vietnam	1.1175	0.2567	0.1463	0.0086	0.0306	0.1084	0.2573	1.9254
India	1.1805	0.2567	0.1131	0.0111	0.0312	0.1076	0.2628	1.9631
Bangladesh	1.2101	0.2567	0.1505	0.0122	0.0326	0.1156	0.2742	2.0519
Indonesia	-	-	-	-	-	-	-	-
Kenya	1.1621	0.2567	0.1174	0.0167	0.0311	0.2549	0.0000	1.8389
Madagascar	-	-	-	-	-	-	-	-
Ethiopia	1.1688	0.2567	0.1549	0.0055	0.0317	0.2910	0.0000	1.9086
Tanzania	-	-	-	-	-	-	-	-
Ghana	1.2379	0.2567	0.1921	0.0236	0.0342	0.2256	0.0000	1.9701

Table C.2: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the GLWC Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Garment Finishing Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	7.9278	1.3799	1.1468	0.0449	0.2426	0.3223	0.3342	1.8367	13.2352
Vietnam	7.0254	1.3799	0.4389	0.0262	0.1438	0.2704	0.3410	1.5412	11.1668
India	7.3201	1.3799	0.3394	0.0337	0.0718	0.2743	0.3404	1.5636	11.3231
Bangladesh	7.5192	1.3799	0.4516	0.0367	0.1099	0.2849	0.3614	1.6238	11.7674
Indonesia	-	-	-	-	-	-	-	-	
Kenya	7.4342	1.3799	0.3521	0.0502	0.0918	0.2792	0.6639	0.0000	10.2513
Madagascar	-	-	-	-	-	-	-	-	
Ethiopia	7.4905	1.3799	0.4648	0.0165	0.0974	0.2835	0.7434	0.0000	10.4758
Tanzania	-	-	-	-	-	-	-	-	
Ghana	7.8169	1.3799	0.5762	0.0709	0.2896	0.3040	0.5963	0.0000	11.0337

Appendix D: Landed Cost per T-shirt and per Pair of Denim Jeans in U.S. Dollars by Paying the Asia Floor Wage

Table D.1: Landed Cost per T-shirt in U.S. Dollars by Paying the Asia Floor Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	1.2350	0.2567	0.5326	0.0150	0.0408	0.1151	0.3432	2.5384
Vietnam	1.1175	0.2567	0.2330	0.0086	0.0323	0.1102	0.2719	2.0303
India	1.1805	0.2567	0.1437	0.0111	0.0318	0.1083	0.2679	2.0001
Bangladesh	1.2101	0.2567	0.0970	0.0122	0.0315	0.1144	0.2652	1.9871
Indonesia	1.0995	0.2567	0.1652	0.0101	0.0306	0.1256	0.2577	1.9454
Kenya	-	-	-	-	-	-	-	-
Madagascar	-	-	-	-	-	-	-	-
Ethiopia	-	-	-	-	-	-	-	-
Tanzania	-	-	-	-	-	-	-	-
Ghana	-	-	-	-	-	-	-	-

Table D.2: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the Asia Floor Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Garment Finishing Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	7.9278	1.3799	1.5977	0.0449	0.3219	0.3382	0.3761	1.9273	13.9139
Vietnam	7.0254	1.3799	0.6991	0.0262	0.1896	0.2796	0.3470	1.5936	11.5404
India	7.3201	1.3799	0.4312	0.0337	0.0879	0.2776	0.3425	1.5821	11.4550
Bangladesh	7.5192	1.3799	0.2909	0.0367	0.0816	0.2792	0.3577	1.5915	11.5367
Indonesia	6.9487	1.3799	0.4955	0.0300	0.0955	0.2685	0.3769	1.5302	11.1250
Kenya	-	-	-	-	-	-	-	-	
Madagascar	-	-	-	-	-	-	-	-	
Ethiopia	-	-	-	-	-	-	-	-	
Tanzania	-	-	-	-	-	-	-	-	
Ghana	-	-	-	-	-	-	-	-	

Appendix E: Landed Cost per T-shirt and per Pair of Denim Jeans in U.S. Dollars by Paying the WageIndicator.org Wage

Table E.1: Landed Cost per T-shirt in U.S. Dollars by Paying the WageIndicator.org Wage

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	-	-	-	-	-	-	-	-
Vietnam	1.1175	0.2567	0.1880	0.0086	0.0314	0.1093	0.2644	1.9758
India	1.1805	0.2567	0.1378	0.0111	0.0317	0.1081	0.2669	1.9929
Bangladesh	1.2101	0.2567	0.1072	0.0122	0.0317	0.1146	0.2669	1.9995
Indonesia	1.0995	0.2567	0.1355	0.0101	0.0300	0.1249	0.2528	1.9095
Kenya	1.1621	0.2567	0.1201	0.0167	0.0311	0.2550	0.0000	1.8418
Madagascar	1.1614	0.2567	0.1123	0.0243	0.0311	0.2511	0.0000	1.8368
Ethiopia	1.1688	0.2567	0.2062	0.0055	0.0327	0.2921	0.0000	1.9620
Tanzania	1.1606	0.2567	0.1607	0.0139	0.0318	0.2479	0.0000	1.8717
Ghana	1.2379	0.2567	0.1837	0.0236	0.0340	0.2196	0.0000	1.9555

Table E.2: Landed Cost per Pair of Denim Jeans in U.S. Dollars by Paying the WageIndicator.org Wages

Country	Fabric Cost ($)	Trim Cost ($)	Labor Cost ($)	Energy Cost ($)	Garment Finishing Cost ($)	Off-Quality Cost ($)	Transportation Cost ($)	Duty ($)	Landed Cost ($)
China	-	-	-	-	-	-	-	-	
Vietnam	7.0254	1.3799	0.5639	0.0262	0.1658	0.2748	0.3439	1.5664	11.3463
India	7.3201	1.3799	0.4133	0.0337	0.0848	0.2770	0.3421	1.5785	11.4293
Bangladesh	7.5192	1.3799	0.3215	0.0367	0.0870	0.2803	0.3584	1.5977	11.5807
Indonesia	6.9487	1.3799	0.4064	0.0300	0.0798	0.2653	0.3748	1.5123	10.9972
Kenya	7.4342	1.3799	0.3604	0.0502	0.0932	0.2795	0.6641	0.0000	10.2616
Madagascar	7.4279	1.3799	0.3368	0.0730	0.0870	0.2791	0.6553	0.0000	10.2390
Ethiopia	7.4905	1.3799	0.6186	0.0165	0.1244	0.2889	0.7469	0.0000	10.6658
Tanzania	7.4217	1.3799	0.4822	0.0417	0.1209	0.2834	0.6495	0.0000	10.3794
Ghana	7.8169	1.3799	0.5511	0.0709	0.2852	0.3031	0.5957	0.0000	11.0028

Appendix F: Labor Cost per T-shirt and per Pair of Denim Jeans in U.S. Dollars by Paying Different Living Wages

Table F.1: Labor Cost in U.S. Dollars per T-shirt by Paying the GLWC Wage

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.3295	0.0527	0.3823
Vietnam	0.1261	0.0202	0.1463
India	0.0975	0.0156	0.1131
Bangladesh	0.1298	0.0208	0.1505
Indonesia	-	-	-
Kenya	0.1012	0.0162	0.1174
Madagascar	-	-	-
Ethiopia	0.1336	0.0214	0.1549
Tanzania	-	-	-
Ghana	0.1656	0.0265	0.1921

Table F.2: Labor Cost in U.S. Dollars per Pair of Denim Jeans by Paying the GLWC Wage

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.9886	0.1582	1.1468
Vietnam	0.3783	0.0605	0.4389
India	0.2925	0.0468	0.3394
Bangladesh	0.3893	0.0623	0.4516
Indonesia	-	-	-
Kenya	0.3035	0.0486	0.3521
Madagascar	-	-	-
Ethiopia	0.4007	0.0641	0.4648
Tanzania	-	-	-
Ghana	0.4967	0.0795	0.5762

Table F.3: Labor Cost in U.S. Dollars per T-shirt by Paying the Asia Floor Wage

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	0.4591	0.0735	0.5326
Vietnam	0.2009	0.0321	0.2330
India	0.1239	0.0198	0.1437
Bangladesh	0.0836	0.0134	0.0970
Indonesia	0.1424	0.0228	0.1652
Kenya	-	-	-
Madagascar	-	-	-
Ethiopia	-	-	-
Tanzania	-	-	-
Ghana	-	-	-

Table F.4: Labor Cost in U.S. Dollars per Pair of Denim Jeans by Paying the Asia Floor Wage

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	1.3773	0.2204	1.5977
Vietnam	0.6027	0.0964	0.6991
India	0.3717	0.0595	0.4312
Bangladesh	0.2508	0.0401	0.2909
Indonesia	0.4271	0.0683	0.4955
Kenya	-	-	-
Madagascar	-	-	-
Ethiopia	-	-	-
Tanzania	-	-	-
Ghana	-	-	-

Table F.5: Labor Cost in U.S. Dollars per T-shirt by Paying the WageIndicator.org Wage

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	-	-	-
Vietnam	0.1620	0.0259	0.1880
India	0.1188	0.0190	0.1378
Bangladesh	0.0924	0.0148	0.1072
Indonesia	0.1168	0.0187	0.1355
Kenya	0.1036	0.0166	0.1201
Madagascar	0.0968	0.0155	0.1123
Ethiopia	0.1778	0.0284	0.2062
Tanzania	0.1386	0.0222	0.1607
Ghana	0.1584	0.0253	0.1837

Table F.6: Labor Cost in U.S. Dollars per Pair of Denim Jeans by Paying the WageIndicator.org Wage

Country	Direct Labor Cost ($)	Indirect Labor Cost ($)	Total Labor Cost ($)
China	-	-	-
Vietnam	0.4861	0.0778	0.5639
India	0.3563	0.0570	0.4133
Bangladesh	0.2771	0.0443	0.3215
Indonesia	0.3503	0.0561	0.4064
Kenya	0.3107	0.0497	0.3604
Madagascar	0.2903	0.0465	0.3368
Ethiopia	0.5333	0.0853	0.6186
Tanzania	0.4157	0.0665	0.4822
Ghana	0.4751	0.0760	0.5511

Appendix G: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying Different Living Wage

Table G.1: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying the GLWC Wage

Country	Labor Cost ($)	Water Cost ($)	Total Cost ($)
China	0.2017	0.0409	0.2426
Vietnam	0.0772	0.0666	0.1438
India	0.0597	0.0121	0.0718
Bangladesh	0.0794	0.0304	0.1099
Indonesia	-	-	-
Kenya	0.0619	0.0299	0.0918
Madagascar	-	-	-
Ethiopia	0.0817	0.0156	0.0974
Tanzania	-	-	-
Ghana	0.1013	0.1882	0.2896

Table G.2: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying the Asia Floor Wage

Country	Labor Cost ($)	Water Cost ($)	Total Cost ($)
China	0.2810	0.0409	0.3219
Vietnam	0.1229	0.0666	0.1896
India	0.0758	0.0121	0.0879
Bangladesh	0.0512	0.0304	0.0816
Indonesia	0.0871	0.0083	0.0955
Kenya	-	-	-
Madagascar	-	-	-
Ethiopia	-	-	-
Tanzania	-	-	-
Ghana	-	-	-

Table G.3: Labor and Water Cost for Finishing Denim Jeans in U.S. Dollars by Paying the WageIndicator.org Wage

Country	Labor Cost ($)	Water Cost ($)	Total Cost ($)
China	-	-	-
Vietnam	0.0992	0.0666	0.1658
India	0.0727	0.0121	0.0848
Bangladesh	0.0565	0.0304	0.0870
Indonesia	0.0715	0.0083	0.0798
Kenya	0.0634	0.0299	0.0932
Madagascar	0.0592	0.0277	0.0870
Ethiopia	0.1088	0.0156	0.1244
Tanzania	0.0848	0.0361	0.1209
Ghana	0.0969	0.1882	0.2852

Appendix H: T-shirt and Denim Jeans Transportation Costs to the U.S. Including Insurance by Paying Different Living Wage

Table H.1: T-shirt Transportation Costs to the U.S. Including Insurance by Paying the GLWC Wage

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/T-shirt ($)
China	4,022.36-4,445.77	0.1059
Vietnam	4,118.81-4,552.37	0.1084
India	4,089.32-4,519.78	0.1076
Bangladesh	4,391.29-4,853.54	0.1156
Indonesia	-	-
Kenya	9,688.06-10,707.85	0.2549
Madagascar	-	-
Ethiopia	11,057.42-12,221.36	0.2910
Tanzania	-	-
Ghana	8,572.48-9,474.84	0.2256

Table H.2: Denim Jeans Transportation Cost to the U.S. Including Insurance by Paying the GLWC Wage

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/Jeans ($)
China	5,848.71-6,464.36	0.3342
Vietnam	5,967.29-6,595.43	0.3410
India	5,956.30-6,583.28	0.3404
Bangladesh	6,323.84-6,989.51	0.3614
Indonesia	-	-
Kenya	11,617.89-12,840.82	0.6639
Madagascar	-	-
Ethiopia	13,008.78-14,378.13	0.7434
Tanzania	-	-
Ghana	10,435.28-11,533.73	0.5963

Table H.3: T-shirt Transportation Costs to the U.S. Including Insurance by Paying the Asia Floor Wage

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/T-shirt ($)
China	4,373.78-4,834.18	0.1151
Vietnam	4,189.24-4,630.21	0.1102
India	4,114.27-4,547.35	0.1083
Bangladesh	4,347.77-4,805.43	0.1144
Indonesia	4,771.04-5,273.26	0.1256
Kenya	-	-
Madagascar	-	-
Ethiopia	-	-
Tanzania	-	-
Ghana	-	-

Table H.4: Denim Jeans Transportation Cost to the U.S. Including Insurance by Paying the Asia Floor Wage

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/Jeans ($)
China	6,582.26-7,275.13	0.3761
Vietnam	6,072.23-6,711.41	0.3470
India	5,993.41-6,624.29	0.3425
Bangladesh	6,258.97-6,917.81	0.3577
Indonesia	6,595.39-7,289.64	0.3769
Kenya	-	-
Madagascar	-	-
Ethiopia	-	-
Tanzania	-	-
Ghana	-	-

Table H.5: T-shirt Transportation Costs to the U.S. Including Insurance by Paying the WageIndicator.org Wage

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/T-shirt ($)
China	-	-
Vietnam	4,152.70-4,589.83	0.1093
India	4,109.44-4,542.01	0.1081
Bangladesh	4,356.54-4,815.12	0.1146
Indonesia	4,746.87-5,246.55	0.1249
Kenya	9,690.43-10,710.47	0.2550
Madagascar	9,540.43-10,544.68	0.2511
Ethiopia	11,099.11-12,267.43	0.2921
Tanzania	9,421.33-10,413.05	0.2479
Ghana	8,343.43-9,221.68	0.2196

Table H.6: Denim Jeans Transportation Cost to the U.S. Including Insurance by Paying the WageIndicator.org Wage

Cut and Sew Country	$/40ft Container Including Insurance	Transportation Cost/Jeans ($)
China	-	-
Vietnam	6,017.76-6,651.21	0.3439
India	5,986.23-6,616.35	0.3421
Bangladesh	6,271.42-6,931.57	0.3584
Indonesia	6,559.38-7,249.84	0.3748
Kenya	11,621.36-12,844.67	0.6641
Madagascar	11,467.60-12,674.71	0.6553
Ethiopia	13,070.89-14,446.78	0.7469
Tanzania	11,366.86-12,563.37	0.6495
Ghana	10,425.05-11,522.43	0.5957