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Total Cost of Ownership for Apparel under Responsible Production Conditions

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Abstract

Low cost production motivates global apparel brands to source apparel from less developed countries. However, low-cost apparel production is commonly accompanied by human rights violations. Research suggests that brand pricing practices are a major reason behind labor rights violations in global apparel supply chains (Anner, 2013). To date, academics and practitioners remain unaware of the actual cost of responsible apparel production required ensure adequate labor rights. To address this gap, this study establishes a baseline cost model and presents an initial responsible cost model that considers the cost of labor standards implementation based on a Total Cost of Ownership (TCO) approach. Cost data for cotton t-shirt production is provided by nine Bangladeshi factories who supply major western brands. Further, audit data for labor practices among the nine factories is also reviewed to establish an understanding of each factory's current labor practices.

Keywords: Apparel Sourcing, Total Cost of Ownership, Labor Rights, Corporate Social Responsibility, Bangladesh

Article Classification: Research Paper

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1. Introduction

The introduction of the mechanical sewing machine in 1850 transformed cottage-based apparel production into industrial large-scale mass production which relied heavily on low-cost labor, using workers with low levels of education and little technical expertise (Abernathy et al., 2006, York et al., 2016). These industry conditions created workplace environments that we refer to today as sweatshops. The negative ramifications of sweatshop practices in the domestic U.S. apparel industry are well documented, as exemplified by the Triangle Shirtwaist Factory fire in lower Manhattan which killed 146 people in the early twentieth century (Von Drehle, 2004). Although the U.S. improved labor conditions for its workers through policy initiatives over the years, globalization that focuses on supply chains with low-cost production perpetuate sweatshop conditions much like those of the past (Appelbaum et al., 2016). Many Western countries do not appear overly concerned with working conditions in emerging countries and are able to rationalize that these working conditions as *acceptable* (Wieland and Handfield, 2014).

In 2016 Rogers noted that the emergence of global supply chains had the unintended effect of reviving global sweatshop practices in labor intensive industries (Nova & Wegemer, 2016c). Anner (2017) suggests a global pattern of human rights violation in supply chains, including textiles and apparel, across multiple continents. Wang (2005) reports that over 90 percent of Vietnamese firms violate the legal limits on overtime. The Rana Plaza incident in Bangladesh which killed 1,138 workers marks a critical turning point in global awareness of human rights violations (Kennedy, 2014). Stakeholders in academia, industry and government began to pursue initiatives to promote human rights improvement in the Global Apparel Industry (Anner, 2015a). In addition, consumer awareness of this event created negative implications for numerous western brands who reap profits from their engagement in global supply chains (Zaman, 2013). Consumer activism towards brands engaged in unethical activities began to question brands' reputations and called for greater transparency in the global business environment. This has led many brands to re-evaluate their production practices and supplier code of conduct practices.

Academics from diverse fields have responded to the call for human rights by focusing research efforts on safety and sustainability practices in the global apparel industry from diverse disciplines (e.g., public policy, accounting, supply chain management, labor law, etc.) (Labowitz. et. al., 2014; Anner, 2015a; Islam et.al., 2018). This research can be characterized as developmental and fragmented in terms of disciplinary approaches and focal purposes. Given the growing need for textile and apparel supply chains to consider the implications of adopting responsible production practices, the current research establishes an understanding of the true cost of incorporating these practices into production. The overarching purpose of the study is to establish a total cost of ownership model for apparel production that incorporates global labor rights standards. The following research objectives are stated to address the central purpose:

Research Objective One (RO1): To establish a baseline cost of ownership model for apparel production using actual supplier data from a low-cost producing country.

Research Objective Two (RO2): To establish a responsible cost of ownership model that incorporates costs generated by implementation of existing global labor rights standards based on the model established in RO1 (i.e., ILO core labor standard).

The study contributes to knowledge for both practitioners and researchers. Primarily, the research demonstrates the initial empirical effort to establish a transparent cost model that considers sources of cost incurred through implementation of labor rights standards in production based on real evidence from the field. That is, the research utilizes factory-level cost data, provided by active global apparel suppliers in Bangladesh from 2017, which provides realism for construction of the cost models. An additional feature of this study is incorporation of the Total Cost of Ownership (TCO) approach into the textile and apparel context. Used in industries and supply chains outside of textiles and apparel (e.g., automotive) TCO is recognized for effectively breaking down sources of cost among supply chain activities which makes the method useful for supplier selection (Wouters. et. al., 2005., Garfamy., 2006; Degraeve. et. al. 2000).

2. Literature Review

Literature from different sources are reviewed to inform the study's objectives. The academic stream within the cost literature that focuses on quantifying manufacturing costs for apparel supply chains is first considered. The review also focuses s on the empirical work associated with the Total Cost of Ownership model which to-date is primarily applied in industries outside of textiles and apparel. Additionally, recent work is reviewed that defines and considers the concept of social responsibility within global manufacturing is reviewed to establish an understanding of the study's context. Trade literature and government are incorporated to identify existing labor rights standards for responsible manufacturing.

2.1.Product Costing for Apparel and Costing Methods

The literature that considers product costing for apparel is both limited and outdated. Among this stream of literature, researchers focus on costing methods and cost dynamics associated with sourcing in global supply chains. Additionally, several doctoral dissertations demonstrate efforts to generate cost models for apparel using secondary data from potentially unreliable sources (e.g., www.worldfreightrate.com).

Hergeth (1996) conceptually considered use of different costing methods within the textile industry. He suggested that despite the availability of newer cost methods at that time (i.e., activity-based costing) the industry continued to use conventional costing systems. Hergeth pointed out the inherent shortcomings associated with the industry's lack of adoption of the newer methods, which generate clearer, more accurate cost allocations. Rendall et. al. (1999) expanded this argument by suggesting that textile companies could benefit from using updated accounting systems to identify overhead costs associated with specific products in order to inform better decision making.

2.2 Sourcing Costs

The literature indicates several empirical and conceptual studies that focus on aspects of apparel costing, predominantly from a global supply chain sourcing perspective. Hines (2002) criticized UK apparel retailers' sourcing decisions for overlooking hidden costs of sourcing in the global environment (e.g., plant visits, response time, etc.). Hergeth (2002) examined hidden costs in offshore manufacturing practices among 28 U.S. apparel companies. Using a survey, he identified numerous hidden costs including: transportation, training & expatriate management, facility management, quality and marketing. Hergeth further noted that the firms in the sample tended to classify hidden costs as corporate overhead, thereby distorting actual cost at the product level.

In response to the shortcomings of cost and risk determination in global supply chains, Holweg, Reichhart and Hong (2011) proposed a comprehensive model designed to consider cost and risk to ultimately improve managerial sourcing decisions. Their model specifies three categories of cost: static, dynamic, and hidden cost, which they subsequently testing in the U.S. apparel context and found that many times global sourcing is not beneficial since hidden cost and dynamic cost are not considered in the initial calculations.

2.3 Cost Models for Apparel

The literature offers several examples of cost models for apparel with different foci. Yeh and Yang (2003) developed a cost model to compare garment dying under immediate versus postponed distribution scenarios. Their comparison suggests lower costs associated with the postponement scenario, when the following parameters have large values: total demand quantity, number of colors, inventory holding cost rate, demand standard deviation, lead-time, and safety stock. In a similar study, Sabir et. al. (2014) developed a simulation model to determine product cost, time and operator needs under variable demand scenarios.

A series of related theses and a single doctoral dissertation demonstrate efforts to generate apparel cost models for U.S. markets. These empirical efforts rely heavily on cost estimations from secondary data sources that commonly lack precision but provide examples of models generated by academics for this industry. Fiallos (2010) executed an initial effort to develop a comprehensive product cost model for sourcing cotton t-shirts and denim jeans from multiple countries to the U.S. market. His approach considers the full supply chain from yarn production to product delivery and incorporates diverse data including: secondary factory data, trade association data, and consulting report data. Building on Fiallos' (2010) effort, Liu (2012) developed a model to calculate freight-on-board (FOB) costs for cotton t-shirts and denim jeans based on trade association data [e.g., International Textile Manufacturing Federation (ITMF)]. Liu compared the model's calculations with OTEXA data and did not find agreement. More recently, Adikorley (2016) applied the Fiallos model, in a focused examination on sourcing cotton t-shirts and denim jeans from countries in Sub-Saharan Africa (SSA).

In summary, the empirical work to date that focuses on costing directly within the apparel context relies on estimated or simulated costs, which leads to results that are difficult to generalize in

practice. As stated by a number of researchers, actual cost data are needed to generate more applicable cost models within the industry context (Ellram, 1995; Wouters. et. al., 2005).

2.4. Total Cost of Ownership (TCO) Approach, Application and Limitations

Strategic management researchers who focus on costing methods introduced Total Cost of Ownership (TCO), a philosophical approach to quantifying cost in supply chains. Ellram (1994a) defines TCO as, "an innovative philosophy aimed at developing an understanding of the *true* cost of doing business with a particular supplier for a particular good or service" (p.171). In practice, the TCO adopts one of two approaches: *value-based* and *dollar-based* (Ellram, 1995). The value-based approach is deductive whereby each cost element represents a percentage of the total product cost. In contrast, the dollar-based approach assigns actual cost to each element and summates these elements to generate total cost. Ellram (1995) suggests that the dollar-based approach is advantageous due to: the communication of actual costs associated with unique elements, flexibility in focusing on cost elements and its overall simplicity. However, she emphasizes that difficulty accessing proprietary cost data poses a challenge for TCO empirical application (Ellram, 1995).

Research demonstrates TCO application among business to business (B2B) transaction contexts (Saccani et. al. 2017). Ellram and Siferd (1998) report that TCO is widely used for supplier qualification, supplier evaluation and supplier selection. Empirical application of TCO is primarily evident among enquiry into industries outside of apparel manufacturing (e.g., automotive and information technology) (Nilprapunt et. al., 2016; Rusich et. al., 2015; Walterbusch et al., 2013). Application of TCO to apparel costing is scant in both the academic and trade literatures. Among this limited body of work, researchers use TCO to determine life-cycle costing (Velden, 2017).

Researchers note limitations of TCO that contribute to its lack of application among industries that could otherwise benefit from the model's capabilities. Limitations are attributed to complex cost accounting and lack of reliable, accessible costing data among firms (Ellram, 1993; Ellram, 1995; Ellram & Feitzinger, 1997; Wouters et al., 2005; Song et. al. 2007). A related shortcoming of TCO is the inherent difficulty in quantifying non-monetary issues (e.g., supplier performance, social policy) (Bhutta & Huq, 2002). An additional challenge for TCO is the reliance on high levels of trust between supply chain partners who are required to share cost data (Ellram, 1995; Ellram & Siferd, 1998; Zachariassen & Stentoft Arlbjørn 2011). Indeed, TCO requirement for reliable and costing data is critical to effective practical application. Researchers also report that the quality of TCO data is an important determinant for successful adoption and implementation of TCO (Swenson, 1995, McGowan & Klammer, 1997, Wouters et al., 2005).

2.4 Labor Rights in Apparel Manufacturing: Standards, Violations and Drivers of Violations

Global awareness of labor rights standards began to emerge in the 1990s as corporations were forced to respond to growing activism against unethical labor conditions and human rights violations in their supply chains. As a result, firms began to engage in efforts to establish codes of conduct to reduce reputational risks in the marketplace. (O'Rourke., 2003; Finnegan, 2013).

Today, numerous codes of conduct that exist among global supply chains with varying purposes. These codes are predominantly built upon the International Labor Organization (ILO) core labor standards and basic health & safety, wage and working hour principles (O'Rourke., 2003). The ILO Core Labor Standard provides fundamental guidelines for labor practices including: forced labor, child labor, discrimination, collective bargaining, etc. Van Tulder and Kolk (2001) reviewed labor standards usage in global supply chains and report that complexity associated with non-discrimination and freedom of association standards drives less consistent application of these standards (O'Rourke., 2003). O'Rourke also reports that large global brands (e.g., Wal-Mart, H&M) developed procedures to monitor supplier compliance with explicit codes of conduct, through extending existing auditing resources or establishing a wholly new auditing department. In addition, third party auditors have emerged in the U.S. and Europe to establish and monitor labor standards [e.g., Fair Labor Association (FLA), Social Accountability International (SAI), and the Worldwide Responsible Apparel Production (WRAP)]. The prominent European third-party auditing organizations include: Fair Wear Foundation (FWF) and Ethical Trading Initiative (ETI). O'Rourke notes that these systems are built on ILO standards but differ in their approach to auditing, certification and reporting.

Despite the existence of the ILO core standards, corporate codes of conduct, and the systems to implement and monitor these standards, worker rights violations prevail in global apparel supply chains. Boardman et. al. (2015) reported wage violations, forced overtime, false working hour records, unsafe working conditions and pressure against collective bargaining within global supply chains. They also note numerous examples of labor violations among major apparel producing countries including Bangladesh, Vietnam and Guatemala.

The literature provides several explanations of the drivers of labor rights violations. Among this work, the failure of appropriate oversight, a lack of transparency and continued downward price pressure among apparel importers drive violations. A consensus among researchers is emerging that auditing systems fail due to the voluntary nature of implementation & compliance among factories (O'Rourke 1997, Locke et al 2007., Barrientos & Smith, 2007). Researchers clearly demonstrate this failure by pointing out that both Tazeen Fashion, Bagladesh and Ali Enterprise, Pakistan passed audits shortly before disastrous factory fires (Nova & Wegemer, 2016d; Walsh & Greenhouse, 2012a, 2012b).

Anner's (2013) work demonstrates the critical impact of price pressure on the incidence of labor violations. His 2012 inquiry identified a 48 percent decrease in the real dollar price per square meter of U.S. apparel imports based on OTEXA data representing the top 20 exporters from 1989-2010. He noted that the CIRI labor rights scores decreased during the same period and worker wages remained flat or decreased between 2001 and 2010. Anner's work also demonstrates a departure from existing enquiry that focuses primarily on factories as the source of violations (e.g., Yardley 2012, Clifford and Greenhouse 2013). He suggests that violations originate from the

nature of business models commonly adopted by multinational brands seeking increasingly lower costs and are therefore identifiable and predictable. Locke (2013) concurs with Anner by citing price pressure and short delivery schedules as drivers of factory compliance failures.

2.5 Determining the Cost of Labor Rights

To date, very limited extant of research considers the cost of fair labor practices among factories. The relevant work that has been undertaken focuses primarily on the provision of living wages (e.g., Ford, 2017, FLA, 2016, ETI, 2015, CCC, 2014, FWF, 2014). Research efforts to identify costs associated with workplace safety and other labor rights elements are not evident in the academic or trade literatures. Emerging efforts to associate cost with Social Life Cycle Assessment may inform labor rights costing in the future as this line of enquiry gains critical mass (Mattioda., 2015; Velden 2017).

3. Methodology

The methodology for building the TCO incorporates primary and secondary data to address the research objectives. Details for data collection among Bangladeshi factories are provided in the sample description, followed by data collection procedures and model construction & integration.

3.1 Sampling and Data Collection

The sample for the study consists of active Bangladeshi apparel factories that supply market-leading multinational apparel and retail brands. Bangladesh is an appropriate sampling frame for the study given its global prominence in low-cost apparel production. From June 2016 - 2017 Bangladesh exported $28 billion in apparel, making the country the second largest apparel exporter after China (WTO, 2017). Despite positive economic impacts, the Bangladeshi apparel industry is criticized for labor rights violations, following the Rana Plaza collapse which is attributed to downward price pressure in the industry (Anner, 2013; Guardian, 2014; Wieland and Handfield, 2014). By creating visibility into the true operating costs that exist within Bangladeshi factories, a more robust context for discussing sustainable policies for garment production in the global mass market for apparel can be supported.

To generate a sample pool for the research, potential factories were identified and contacted through a major European apparel retailer. This firm is a global retailer, with stores in more than thirty countries (i.e., Europe, North America, and Asia). An initial group of 50 factories were contacted and agreed to participate in the study. At this point, each factory was screened to ensure the availability of a minimum of one year of detailed factory operating expenses for the most recent calendar year (June 2016-2017).

To select specific participants, additional criteria were applied to the 50 factories. Cotton t-shirts were selected as the focal product for building the TCO based on production requirements. Therefore, each factory included in the sample produces cotton t-shirts using a similar process.

Nine factories were identified that meet the inclusion criteria. Analysis of sample representativeness is difficult to accomplish due to lack of existing industry data. However, CPD reports (2017) suggest that the nine factories rank among the top fifty percent in total number of workers. Additionally, as suppliers for top global brands, the nine factories likely represent relatively large firms among the Bangladeshi industry. For the analysis, the factories are distinguished by total number of workers into three categories: small, medium, and large (Table 1). To protect factories' privacy, each respondent is referred to henceforth as factory one (F1) to factory nine (F9).

Table 1: Factory Sample (N=9)

Factory Size		**Factory ID**	**Location**	**Located at EPZ[1]?**	**Public or Private**
Large	More than 3000 workers	F1	Gazipur, Dhaka	NO	Private
		F2	Chittagong EPZ	YES	Private
		F3	Gazipur, Dhaka	NO	Private
Medium	1500-3000 workers	F4	Gazipur, Dhaka	NO	Private
		F5	Gazipur, Dhaka	NO	Private
		F6	Saver, Dhaka	NO	Private
Small	Less than 1500 workers	F7	Gazipur, Dhaka	NO	Private
		F8	Narayanganj	NO	Private
		F9	Mirpur, Dhaka	NO	Private

[1] Export Processing Zone

3.4. Sample Product

A basic 100 percent cotton t-shirt is used to build the TCO (HS code: 61091000). Rationale for using the t-shirt to build the TCO is primarily due to its wide distribution in global markets as well as its straightforward production requirements. Over the past three years, cotton t-shirt exports accounted for a significant proportion (22.0%) of Bangladeshi apparel industry output (Table 2). Technical specifications for the t-shirt used to generate the TCO were provided by the brand.

Table 2: Product Selection for TCO

Product	**HS Code**	**Export Year**	**Export in Billion US$**	**% of total apparel export**
T-shirts, singlets & other vests, knitted or	61091000	2016-17	5.861	23%
		2015-16	6.118	22%
		2014-15	6.064	22%

Each factory provided cost breakdown data (CBD) for t-shirt production for the period between January and June 2017. The CBD data reflects costs associated with materials and production within each factory. Note that costs associated with materials (fabric and accessories) are generated

outside of the factory by external mills appointed by the brand. As a result, the values associated with accessories is constant across suppliers (N=9). While the fabric cost per kg (kilogram) is constant across suppliers (N=9), it varies at factory level based on amount of fabric required to produce a single t-shirt in each factory. Cost of making per t-shirt at the factory level is the function of standard allowed minutes (SAM), factory production efficiency percentage, and factory price per minute. Each of these elements required supplemental data for calculation from the factories. Data for these calculations were provided by the factories except for SAM which required data from the Generalized Sewing Database (GSD[1]) for quantification. To quantify SAM, factory production efficiency percentage and factory price per minute, a series of calculations were required (appendices 4). Following identification and in some cases calculations of the cost elements, data were reviewed with purchasing and technical personnel from the partner brand to ensure accuracy.

3.5. TCO Model Scope

In supplier selection and purchase decision, ideally there are three components of a TCO as pre-transaction components, transaction components, and post-transaction components. But the scope of the TCO in this research is limited to part of the transaction component only. The research will calculate the cost paid by international brands and retailers to their suppliers for a specific apparel product (per piece in FOB USD$). The model does not consider any other costs for brands such as transportation, tariffs, or other administration costs. Additionally, the labor rights standards are limited to only cut and sew operations (not extended to fabric production), since cut and sew operations are historically recognized as most vulnerable for labor rights violations. The research follows a dollar based TCO approach which is primarily used in supplier selection.

3.6. Baseline and Responsible TCO Model Construction

To address RO1, baseline models are constructed for each of the nine factories, using cost data derived from current production practices for cotton t-shirts. The nine factories also provided up-to-date audit data corresponding to a single retail buyer with global market coverage. The audit data provide factory level information on the current implementation of standards which might or might not conform to the responsible condition described in the next section.

Discussed in the literature review, numerous corporate codes of conduct exist in the global apparel industry based on the core ILO labor standards. To determine the responsible TCO, existing labor rights standards and code of conduct certifications were reviewed (i.e., SA8000, BSCI, ETI, FWF, WRAP, Accord, Alliances Safety Audit System). Based on this review, a minimum labor rights requirement for the study is developed that incorporates eight domains which correspond to ILO standards (referred to as chapters): forced labor, child labor, compensation, non-discrimination, working hour, freedom of association, health & safety, disciplinary action. Each chapter was further examined to identify the potential actions that can be undertaken by factories to comply with its articulated standard. Information to provide actual cost at the action level, was sourced from government databases, industry reports, and industrial consulting firms.

[1] http://www.gsdhq.com/

4. Results

The data were combined and integrated to develop the TCO estimates with fabric, accessories, cost of making delineated. The cost of making represents the focus of the study and required extensive calculation and validation among the participating factories. The resulting baseline TCO indicates an average cost of $2.465 (S.D., $0.057) for a single t-shirt (Table 3). In descending order fabric accounts for 64 percent of the average TCO followed by accessories (20%) and Cost of Making (16%). The average baseline TCO varies by factory size: large ($2.47), medium factories ($2.50) and for small factories ($2.430). When interpreting these results it is likely that factory efficiency rather than size contributes significantly to TCO determination.

Table 3: Baseline Total Cost of Ownership Model

TCO Elements*	**Large Factories (F1-F3)**			**Medium Factories (F4-F6)**			**Small Factories (F7-F9)**		
Factory	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**
Fabric Cost per Kg	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88
Fabric Consumption per t-shirt	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Fabric Cost per t-shirt	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
Accessories Cost per t-shirt	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
SAM per t-shirt	7.2	7.2	7.2	7.20	7.2	7.2	7.2	7.2	7.2
Factory Efficiency for the t-shirt	72.0%	74.1%	59.0%	81.0%	85.3%	57.9%	60.0%	67.9%	68.2%
Factory Price Per Min	0.040	0.035	0.038	0.05	0.045	0.041	0.032	0.033	0.032
Cost of Making per t-shirt	0.40	0.34	0.46	0.40	0.38	0.51	0.384	0.35	0.338
FOB per t-shirt (Baseline TCO)	2.468	2.408	2.528	2.468	2.448	2.578	2.452	2.418	2.406

*Factory cost for 100% cotton t-shirt production.

The responsible TCO was calculated by incorporating the cost of labor rights into the baseline TCO (Table 4). The average responsible TCO totaled $2.545 (S.D., $0.6) resulting in a 3.2 percent increase over the average baseline TCO. The results suggests notabe differences between the baseline and the responsible TCO. The $0.08 increase in the cost of the responsible TCO is attributable to cost of making which contributes to factory PPM. Because the fabric and accessories costs are constant both the baseline and responsible TCO, the increased factory PPM is contributing to higher responsible TCO. The incorporation of labor rights standards into the factory cost drives an incremental increase in PPM. The additional cost to comply with responsible

production is higher for small factories compared to their larger counterparts, with an increase in cost of $0.057 versus $0.115, respectively.

Table 4: Responsible Total Cost of Ownership

TCO Elements	**Large Factory (F1-F3)**			**Medium Factory (F4-F6)**			**Small Factory (F7-F9)**		
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**
Fabric Cost per Kg	$6.88	$6.88	$6.88	$6.88	$6.88	$6.88	$6.88	$6.88	$6.88
Fabric Consumption per t-shirt	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230	0.230
Fabric Cost per t-shirt	$1.58	$1.58	$1.58	$1.58	$1.58	$1.58	$1.58	$1.58	$1.58
Accessories Cost per t-shirt	$0.49	$0.49	$0.49	$0.49	$0.49	$0.49	$0.49	$0.49	$0.49
SAM per t-shirt	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Factory Efficiency for the t-shirt	72.0%	74.1%	59.0%	81.0%	85.3%	57.9%	60.0%	67.9%	68.2%
Factory Price Per Min	0.0450	0.0399	0.0431	0.0510	0.0514	0.0480	0.0413	0.0428	0.0432
Cost of Making per t-shirt	$0.45	$0.39	$0.526	$0.45	$0.43	$0.597	$0.495	$0.454	$0.456
FOB per t-shirt (=Responsible TCO)	$2.518	$2.456	$2.595	$2.522	$2.502	$2.665	$2.564	$2.522	$2.524

5. Conclusions, Implications and Future Research

The TCO method is widely adopted approach in business-to-business settings among academics and practitioners. Despite TCO's usefulness in parsing cost in complex supply chains it has not been applied the global apparel industry. This study capitalizes on the utility of TCO to better understand pricing dynamics in the industry from both a conventional perspective (baseline) and a responsible perspective. Further, the study is the first to use actual costing data provided by a major global apparel brand. Additionally, efforts to identify and quantify a globally recognized code of conduct supports the future research into the true cost of labor rights standards for brands and producers in the global apparel industry. Further, the responsible TCO model for apparel demonstrates the cost structure for responsibly produced apparel which provides a basis for understanding and negotiating socially responsible production.

The TCO addresses the needs of practitioners who call for transparent pricing in the global apparel industry (BCG, 2017; SSGS, 2016; BCG, 2014). The TCO also provides a tool that supports a transparent negotiation process among supply chain partners, which can potentially reduce labor rights violations. Additionally, the TCO creates an industry-level benchmark for global apparel producers and buyers to compare product cost and identify their relative positions.

As an initial attempt to construct a transparent responsible cost model, the research presents limitations associated with the design. Because of the limited number of suppliers with comprehensive data (which is a prerequisite to build a reliable TCO), we have chosen a narrow sample to build the TCO. Future research into a more diverse factory sample would likely generate different cost models.

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